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Collective Review

THE EMBRYOLOGY OF THE ALIMENTARY TRACT, WITH SPECIAL EMPHASIS ON THE COLON AND RECTUM

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FOR THE SURGEON who devotes part of his time to repairing abnormalities of the distal intestine and urinary tracts, a working understanding of their normal development is exceedingly helpful. Such an understanding gives an anatomical background and an appreciation of the normal relationship of the various parts. Practical solutions for repair and correction of the various abnormalities evolve as one appreciates the background of this development. Furthermore, there is real delight for many who witness the transition of one stage to a more advanced one in the orderly process called growth.

For those who wish to follow briefly the growth of a single cell to an almost adult form, the Figures 1 through 13 and their legends can be scanned. For those who wish a more detailed portrayal of this process, this text has been prepared.

The development of the intestinal tract, with special reference to the colon and anus, must begin with a single cell and present the broad outline of the different phases in this development. The vast array of painstaking and detailed studies of human embryos over the last 50 years by many investigators (His, 31, Keibel and Mall, 40, Frazer and Robbins, 21, Pernkopf, 58, Lewis, 48; the present day standard texts of Arey, 2 and Patten, 57; and recent reviews by other authors, 47, 19, 38) have made it possible to construct a simple story of this very complicated process of development. The single cell multiplies into a ball of cells which then forms two cavities joined by a plate of embryonic tissue from which the adult body develops. At first this embryonic plate is composed of two layers of cells; the upper layer forms the nervous system and integument, and the lower layer produces the intestinal tract and those structures which are ancillary to it. The original flat plate, like the lower layer of cells, folds in laterally to form a hollow tube; the ends of this tube are also folded inward. The tube grows in size and length at a tremendous rate. The lower portion of the urinary tract is formed from an infolding of the layer of cells forming the terminal portion of the intestinal tract. The tail end of the intestinal tract and primitive bladder is closed over by a thin membrane, lined internally by cells from intestinal origin and externally by cells derived from the integument. While the embryo consists only of a double layer of cells in the form of a plate, a communication between the two cavities on either side of this

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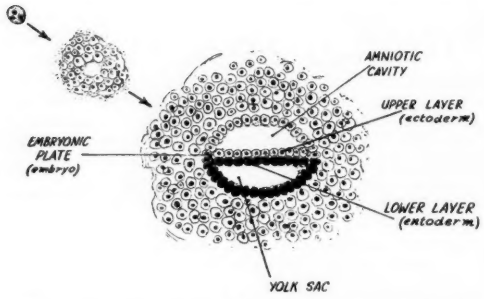

FIG. 1 (50, 11, 27, 69). From single cell to double cavity. This diagrammatic sketch indicates a fertilized cell multiplying into a ball of cells, in the center of which two cavities appear separated by a double row of cells which represent the embryonic plate from which the embryo develops (approximately 8 days).

plate forms as a neurenteric canal toward the tail end of the embryo for a few short hours. Thus, at a very early period there is a communication between the cells which are the precursors of the nervous system and those which form the distal intestine.

The tail end of the intestinal tract communicates with the primitive bladder. This common passageway between the intestinal and urinary tracts persists in some of the lower forms of life, but in man is ended by a separation of the two. The terminal or anal portion of the intestine is formed, in the main, from the external lining or integument as an indentation or infolding. Bones, striated muscles, and nerves of this area originate according to the lateral sacral masses, or somites. The smooth muscle of the intestine and internal sphincter forms in connection with the intestine, and not the anus.

The communication of the intestine with the yolk sac and stalk becomes obliterated. The development of the loops of intestine within the umbilical cord and return to the abdominal cavity, and the rotation of both the duodenal loop and the ileocolic loop about the superior mesenteric artery complete the early phase of the embryonic development. From this time onward until birth and until the adult stage is reached, the process of development is mainly one of maturing.

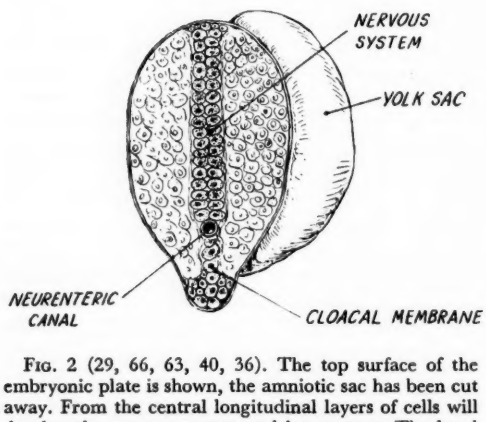

FIG. 2 (29, 66, 63, 40, 36). The top surface of the embryonic plate is shown, the amniotic sac has been cut away. From the central longitudinal layers of cells will develop the nervous system and integument. The head end of the embryo is in the upper portion of the diagram and the tail in the lower portion. The small rounded darkened area toward the tail end indicates a canal (neurenteric) extending through the embryonic plate.

FROM SINGLE CELL TO STRAIGHT TUBE

For those who wish to visualize some of the details of development broadly sketched above, diagrams have been prepared which illustrate the main steps in the growth process. They represent a compilation of the work of many authors. Specific embryological terms have been avoided whenever possible and the more familiar adult counterparts are used.

In Figure 1 the single fertilized cell (ovum) (26, 4) is shown dividing into a group of cells which forms a ball. In the center of this spherical accumulation of cells, two cavities appear (50, 27, 69, 11). Between these two cavities is a double row of cells (upper and lower). The lower row (entoderm) will form the intestinal tract and bladder, and the upper row the nervous system and external surface. The upper cavity will form a sac (amniotic) about the developing central double layer of cells (embryonic plate or embryo) and the lower cavity will form a sac (yolk) which will be quite rapidly reduced to a remnant.

If, now, one looks down on the embryonic plate, Figure 2, with the amniotic sac cut away, he sees a surface of cells with a central and longitudinal pattern. It is from this longitudinal group of cells that the nervous system and integument will develop. At this early age, approximately 19 days (51, 63, 66, 69), there appears a defect or opening in the distal or lower end of the group of cells which is to form the nervous system. This fact is of importance to the student of the intestinal tract because this transitory canal extends directly between the nervous system and the intestinal tract. Thus, for a brief

time this canal (neurenteric canal) connects the cells which are to form the nervous system with the pelvic intestine (66, 7, 36). This phase of embryonic development may thus explain the origin of neurogenic tumors anterior to the sacrum seen later in life (67) and possibly the rare external communications of the rectum in this area.

A side view of the embryo at this time, Figure 3, reveals a sagittal section of the embryonic plate shown in Figure 2. At the left of the diagram the upper and lower layers of cells unite to form the oral membrane. To the right of this oral membrane, the lower layer of cells forms the first evidence of the foregut, then hindgut, neurenteric canal, tailgut and, finally, the upper and lower layers again unite to form the cloacal membrane. A continuation of the lower layer of cells, or the lining cells of the future intestinal tract, forms an outpocketing in this region (allantois) which enters the body stalk. The proximal portion of this outpocketing will form the bladder (48). Thus, in this early stage (19 days and earlier) the same lower layer of cells which forms the distal intestine also differentiates into the future bladder. From a developmental standpoint, then, it would be reasonable when fashioning an artificial bladder to use the distal portion of the intestinal tube as the cell origins of this portion are more closely related to the bladder than those higher up in the intestine. The cell mass lying just distal to the lowermost portion of the neural canal is an undifferentiated tissue and forms the tail bud. It is believed that a persistence of some of these undifferentiated cells may result in later life in the formation of teratomas overlying the sacrococcygeal area.

A further diagram, Figure 4 (33), reveals almost the same features indicated in Figure 3. It is, perhaps, a day later, but the important change is the disappearance of the neurenteric canal and the now evident middle layer of cells (mesoderm). At the left of the diaphragm this is forming the heart, the two layers remain together at the oral membrane, then the middle layer forms the primitive backbone (notochord) (70), and further to the right it becomes a part of the formative cell mass making up the tail bud (70, 16). Finally, the upper and lower layers again meet to form the cloacal membrane and then the lower layer forms the primitive bladder.

The embryonic plate in Figure 2 has rightly been shown as a flat disc and in Figure 3 as an

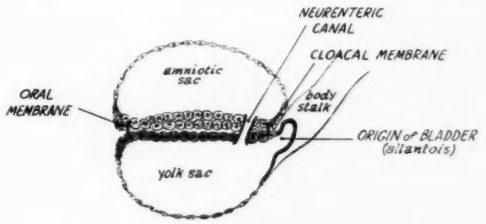

FIG. 3 (29, 66, 63, 40, 36). A diagrammatic sagittal section of the embryonic plate (approximately 19 days). The junction of the upper and lower layer of cells on the left indicates the oral membrane and on the right the cloacal membrane. The neurenteric canal is shown extending between the amniotic cavity and the intestine joined to the yolk stalk. The cells of the intestinal lining have formed a pocket (allantois) extending into the body stalk.

almost straight line in sagittal section. In cross section it would appear also as an almost straight plate, or disc. However, immediately or even at a stage a day or two sooner, both ends, head and tail, begin to curve under the back of the embryo, as indicated in Figure 5. This process brings the oral membrane and cloacal membrane inferiorly and starts to outline the straight intestinal tract. At the same time, as the front and back ends are being drawn under, the sides of the embryo are also curling under to give the embryo and the intestinal tract a cylindrical form. Constriction at the neck of the yolk sac is beginning. At this point it is of interest that the portion of the yolk stalk which will finally pinch off from the formed intestine is at this stage in contact with a portion of the future intestine which will become the stomach. The cells which make up this area may thus be carried in the constricting neck of the yolk stalk and thus account for gastric cells being present in a Meckel's diverticulum.

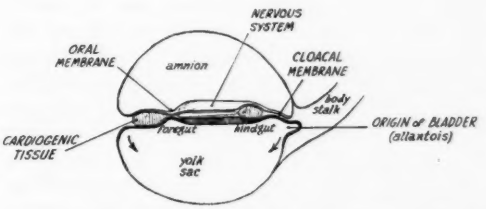

FIG. 4 (33, 25, 12, 63). This is a diagrammatic sketch of a sagittal section of the embryonic plate a day or two later than that shown in Figure 3. The middle layer of cells has formed the notochord and the beginning of the cardiac structures; the neurenteric canal has disappeared.

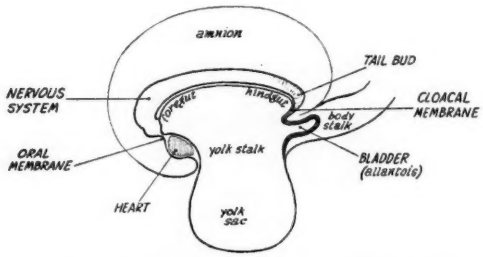

FIG. 5 (3, 15, 63). This is a diagrammatic sketch of a human embryo of about 21 days. Both the head and tail ends of the embryo have been turned under and the plate has curled under on the sides, now to present a nearly straight intestinal tube, the central portion of which is in communication with the constricted yolk stalk.

A slightly further advanced intestinal tract is shown in Figure 6. It remains as an almost straight tube. The abdominal cavity is forming about the intestinal tube, as the result of clefts formed in the embryonic body wall as it folds under. The yolk stalk is becoming more constricted and the embryo nearing the end of the first month of fetal life.

DEVELOPMENT OF THE DISTAL PORTION OF THE INTESTINAL TRACT

It will now be our purpose to concentrate on the terminal portion of that intestinal tube and note the normal phases of development. These are quite complete by the end of the second month, or the 21 mm. stage. The terminal portion of the hindgut communicates with the urogenital sinus, the primary bladder, and the allantois. The communicating area is called the cloaca, Figure 7 (39, 59). At this stage the tail bud is developing but the tailgut is not yet well formed (48, 15). The terminal portion of the cloaca is closed off by the cloacal membrane. The anal hillocks or thickening seen externally on either side of the posterior portion of the cloacal membrane are produced by developing mesoderm, Figure 7 A, and will fuse centrally in front of the anus at a late phase (72), Figure 9 A. The development of a tailgut is a transitory phase, Figure 8, and atrophies by about the sixth week (44). The details of this loss have been worked out by Boyden (9) in the ostrich and it is postulated that an abnormal continuation of this process upward might account for the absence of the terminal portion of the rectum in the most common form of imperforate anus (46). Keith's

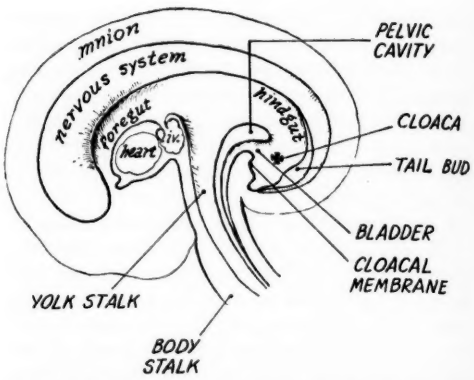

FIG. 6 (30, 59, 3, 15). Diagrammatic sketch of sagittal section of whole embryo of about 3.5 mm., or 26 days. The intestinal tract has now formed a nearly straight tube, communication with the yolk stalk has been narrowed, and the hindgut is in communication with the primitive bladder in the cloaca. Future diagrams are concerned with the development of the terminal portion of the embryo.

opinion, however, is that the hindgut never descends (40, 41).

Further growth of these distal structures, especially the urorectal or cloacal septum, results in a further separation of bladder and the upper portion of the urogenital sinus from the hindgut or developing rectum. This leaves the cloaca narrowed from above down, but the gut and urinary tract are still communicating and closed off from the exterior by the cloacal membrane. In the external frontal view at this stage, Figure 9 A, the membrane extends from the beginning genital tubercle or phallus to tail bud but is being encroached upon and divided by the mesoderm forming the anal hillock and urethral folds, Figure 10 A (28, 56, 72). The anal pit has now formed by the encroaching mesoderm from the anal hillock and is closed anteriorly by the perineal body; that is, the distal end of the urorectal septum. The cloacal membrane remains intact in the region of the anal pit or proctodeum but has ruptured anteriorly in the region of the terminal portion of the urogenital sinus (urethral fissure). The division between the gut and the urinary tract is now practically complete (39, 14, 34). It is easily possible to visualize a communication from these two cavities from the lower end of the bladder to the urethra or perineum by an arrest of the normal division of the two structures at any given level which thus accounts for recto-

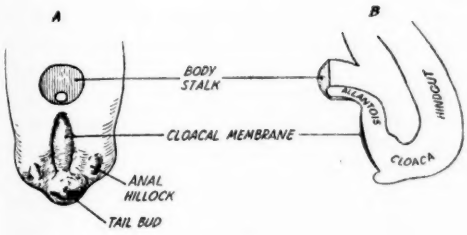

FIG. 7

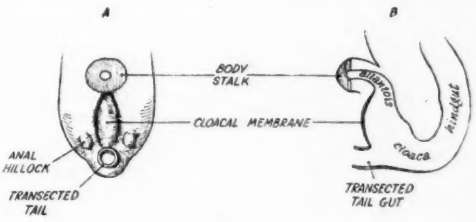

FIG. 8

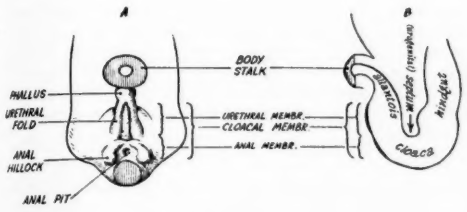

FIG. 9.

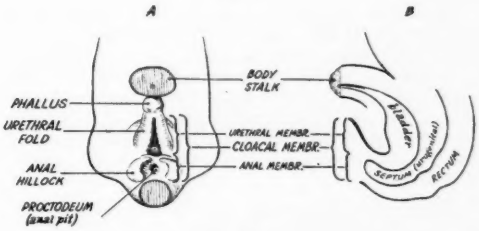

FIG. 10.

FIG. 7 (59, 39). *A* represents a diagrammatic sketch of the frontal view at the tail end of the embryo of about 3 mm. *B* represents the sagittal section of the terminal portion of the hindgut and primitive bladder. The hindgut and bladder (allantois) open into a common receptacle, the cloaca, which is separated from the outside by the cloacal membrane.

FIG. 9 (59, 39, 56, 72). *A* represents the frontal view of human embryo of about 11 mm. The anal hillocks on either side of the lower portion of the cloacal membrane are extending forward and toward the midline to separate the anal portion of the membrane from the urogenital part. *B* a sagittal section of the hindgut and primitive bladder. The tailgut has now disappeared. The septum dividing the hindgut and bladder is extending downward, as indicated by the arrow.

FIG. 8 (71, 59, 39). *A* is a diagrammatic sketch of the frontal view of the tail end of approximately a 4 mm. human embryo. *B* is the sagittal section of the terminal portion of the hindgut and primitive bladder. The common communication chamber now opens into a terminal gut which has been transected in both *A* and *B*. The cloacal membrane separates the common chamber from the outside.

FIG. 10 (14, 39, 56, 34, 28). *A* is a diagrammatic sketch of frontal view of human embryo at approximately 21 mm. The anal pit or proctodeum is now evident. The cloacal membrane above this has been narrowed to a slit or urethral fissure. *B* is a sagittal section. The septum separating the bladder and rectum is now complete. The bladder opens through an enlarged vestibule to the outside.

vesical, rectourethral, or rectoperineal fistulas accompanying an imperforate anus.

EXTERNAL AND INTERNAL CLOSING OF CLOACA IN MALE AND FEMALE

After the sexually indifferent stage shown in Figure 10, the common opening between the bladder, rectum, and the outside undergoes a division into the adult male urethra and anus and the adult female urethra, vagina, and anus, according to the sex. Certain points of difference in this differentiation, important to the intestinal surgeon, will be indicated in Figures 11 and 12 (39, 28, 56). The perineal body has formed as the terminal portion of the downward growing septum between the bladder and urogenital sinus (61), Figure 10 B. This structure becomes united with lateral tissues growing in from the sides anteriorly to form the perineum and raphe posteriorly. The closure is completed by the encircling tissues of the anal hillocks (72). Posteriorly, thus, the anal canal is formed from the skin and integument of this area and not from the hindgut. Rectoperineal fistulas must be due to a defect in the cloacal septum accompanied by a defect in the inward growth of lateral tissues normally closing the cloaca. A defect in closure further anteriorly, that is, toward the penis, Figure 11 A and B, would result in hypospadias. In the female, Figures 10 and 12, the growth of the cloacal septum has been the same as in the male; however, the connection of the mesonephric ducts (wollfian) with the urogenital sinus in the male is replaced by the mullerian fused ducts (vagina, uterus), Figure 12 B (34) in the female. The distal displacement of the vaginal opening toward the

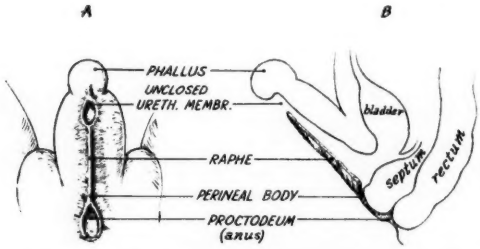

FIG. 11 (65, 39, 28). *A* is a diagrammatic sketch of the frontal view of the male embryo of approximately 48 mm. The growing lateral tissues have now come together in the midline to form the median raphe. Only a tiny slit exposes the urogenital portion of the cloacal membrane. *B* is a sagittal section of the same embryo, indicating growth of the lateral tissues, which has all but closed off the vestibule extending from the bladder to the outside.

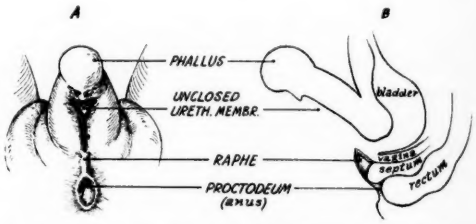

FIG. 12 (65, 39, 56). *A* is a diagrammatic sketch of the female human embryo of about 48 mm., indicating less complete closure of the urogenital portion of the cloacal membrane, with a "golf tee" type opening at the base of the clitoris. *B* is a sagittal section of the same embryo, showing the partial closure of the urogenital vestibule and foreshadowing the subsequent development of the vagina in this area.

perineal body progresses as a part of the shortening of the posterior wall of the urogenital sinus (8, 43). If a defect occurs in the distal end of the cloacal septum and simultaneously in the lateral tissues just anterior to the anus, a communication is established between the anus and posterior wall of the vagina which is the most common type of congenital rectovaginal fistula in the female (17).

DEVELOPMENT OF NERVES, MUSCLES, BLOOD VESSELS, AND BONE OF THE ANORECTAL AREA

The origin of nerves, muscles, blood vessels, and bone in the anorectal area is similar to other areas of the body. The easiest approach for the average surgeon to a study of origins is to begin with the important adult anatomical features of the area and trace their beginnings.

In this review we will start with the internal anal sphincter which is an extension of the longitudinal smooth muscle of the rectal wall. It is under the control of the autonomic nervous system. The origin of the neuromuscular mechanism is depicted in Figure 13. After the stage of the embryonic disc (Figures 2 and 3) in human embryos of 18 days, the middle layer of growing tissue forms into segmental thickenings, on either side of the nervous system, called somites (Figure 13 B). By the beginning of the fifth week these extend all the way to the tip of the tail. In cross section of the lumbar area (Figure 13 A) at this time, the neural tube will have closed in on top and a neural crest ganglia will have formed (23, 7, 1, 32). From this tissue it is believed (2) that the ganglion cells of the autonomic nervous system are formed and pass first to the paravertebral ganglion (35, 22) and then to their most distal position (Auerbach plexus) between the circular and longitudinal smooth muscle of the rectum at a later time. The formation of the smooth muscle layer and thus the internal anal sphincter starts back with the somites. The medial portion of the concentration of mesodermal cells in the somite may be the origin of the smooth muscle fibers which surround the hindgut (Figure 13 A), or these cells may be derived directly from transformation of local mesodermal tissue. A differentiation into internal circular and external longitudinal layers occurs. The longitudinal layer extends almost to the anal verge and thickens to form the internal sphincter.

Now let us start again with a finished product, the external anal sphincter, which is representative of the perineal and levator ani muscles. This muscle probably takes its origin in the somite stage of the embryo, Figure 13 B. Cells destined to form striated muscle pass laterally from the third and fourth sacral somites toward the anterior portion of the lower trunk area (the cloacal area in embryos of 4 to 6 weeks). The formation of striated muscle cells may also be the result of transformation of local mesodermal cells rather than from a migration from the somites (55). In either event, a striated sphincter muscle is formed within the integument on either side of the cloacal membrane, the posterior part of which is destined to form the adult anal sphincter innervated by the voluntary pudendal (spinal) nerve. This voluntary spinal nerve has been formed at the same time that the neural tube has closed (Figure

13 B) (13). The dorsal root of the spinal nerve is formed from ganglion cells which penetrate the neural tube. These ganglion cells were derived from the neural crest. The ventral root of the spinal nerve is derived directly from cells within the neural tube. The axions of these two groups of cells join to form the spinal nerve (pudendal) which, in turn, follows the striated external cloacal (anal) sphincter to the anterior sacral portion of the trunk. With this forward extension of the nerve the sensory fibers (dorsal root) are also carried along to innervate the region of the anal pit (Figure 9 A), proctodeum (Figure 10 A), and adult anal canal. The long course of the pudendal nerve from the lumbosacral plexus and the sacral trunks originating in the adult lumbar spine area is explained by a recession of the human spinal cord (68, 44) which takes place because the spine grows much more rapidly than the spinal cord from the second to the sixth month of fetal life. The vestige of the tip of the neural tube which persists after the recession has taken place in the coccygeal area may be marked by a dimple and is one explanation of the origin of a pilonidal sinus.

Returning to the development of the other adult structures of the anorectal area, the formation of the bones of the pelvis is suggested in Figure 13 B. The pubic ischial and iliac bones form as local condensations in the mesenchyme of the lower trunk beginning with precartilage (fifth week), cartilage (seventh week), and, finally, bone from about the ninth week throughout fetal life (6, 54, 20). The vertebrae, including the sacral portion, are fashioned about the notochord which becomes an obvious structure during the third week (Figure 4). The prebony parts of the vertebrae are formed by the migration of cells in the medial portion of the somites, Figure 13 B.

The blood supply to the anorectal area comes from the aorta through the inferior mesenteric artery to the hindgut and from the umbilical arteries (later hypogastric) to the cloacal (anal) area. The venous return of the hindgut is through the inferior mesenteric and vitelline veins which later form the portal vein. The venous return from the cloacal region is through the hypogastric veins. This basic division is maintained through adult life.

DEVELOPMENT OF THE COLON AND MIDGUT

Division of the intestinal tract into segments is somewhat artificial, but for descriptive purposes seems necessary. As seen in Figure 6, at about 26 days, the intestinal tract is approximately 4 mm. in length. The ventral portion communicates widely with the yolk sac through the yolk stalk. By the time the embryo is double this length and age, the yolk stalk has been constricted down flush with the surface of the intestine and has become separated from it. If it becomes constricted and separated a short distance from its attachment with the intestines, a Meckel's diverticulum is formed (53).

During this early period, in anticipation of the great lengthening which will take place, there is an accompanying proliferation of the endothelial cells lining the intestinal tract and it is at this stage that atresias and double segments of intestine can be formed (10) and result in interruption of continuity or in duplication of segments of any portion of the tract from pharynx to anus. Arrest in growth of portions of the colon results in a congenital microcolon with or without a lumen. Duplication cysts are considered to form at a

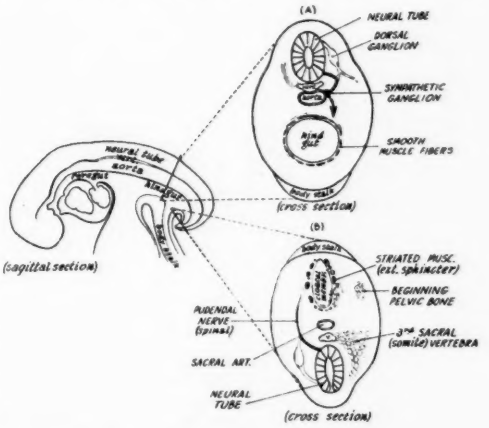

FIG. 13 (22, 35, 5, 45). *A* is a theoretical diagrammatic sketch indicating cross section through the lumbar area of an embryo of approximately 4 mm. to show the development of nerves and muscles of the anorectal area. The spinal nerve with dorsal root and ganglion and ventral root are shown. The sympathetic ganglion is developing in front of the vertebra. Formation of the myenteric plexus is foreshadowed. The smooth muscle of the intestinal tract is indicated. *B*, On the left is indicated the third spinal nerve (pudendal) which innervates the striated muscle of the external anal sphincter. On the right is indicated the somites from which the sacral vertebra is derived and possibly the striated muscle (external sphincter). The beginning of the pelvic bone is diagrammatically indicated.

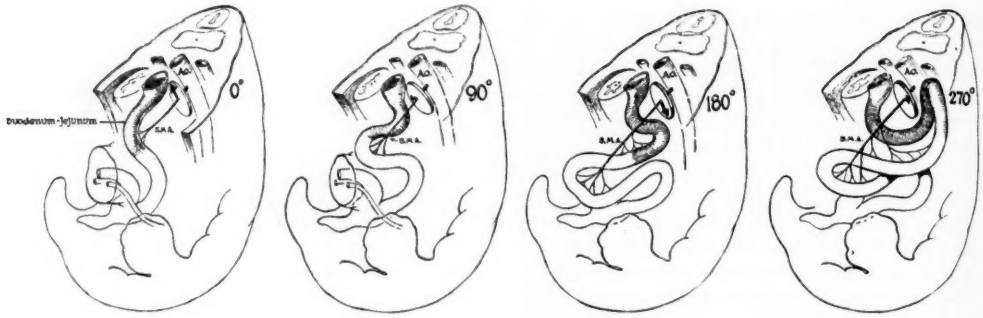

FIG. 14. a, A 5 mm. embryo is shown diagrammatically, cross-sectioned at the level of the lower end of the stomach. The intestine is shown as an almost straight tube with a curve slightly forward. The center of the curve is met by the superior mesenteric artery (SMA) passing at right angles from the aorta (AO). A disc has been placed around the base of the superior mesenteric artery with an arrow pointing straight upward, indicating the starting position, or 0 rotation, of the duodenojejunal loop. Rotation proceeds about the artery as an axis.

b, A similar view of a 10 mm. embryo with the duodenojejunal loop having passed through 90 degrees of rotation to a position on the right of the superior mesenteric artery. In previous descriptions this is considered to be the first stage of rotation.

c, The same view of a 25 mm. embryo at a stage when almost all the intestines are within the cord. It indicates a further rotation of the duodenojejunal loop of 90 degrees through an arc of 180 degrees from the starting position.

d, The same embryo at the 40 mm. stage, at the time the intestines have returned to the abdomen, indicating the final position of the duodenojejunal loop to the left of the artery, or finally through an arc of 270 degrees in a counterclockwise direction. This loop has just passed from a position superior, to the right, beneath, and to the left of the superior mesenteric artery.

later phase than the intestinal endothelial proliferation, that is, at 8 weeks or 20 mm. (49).

As the tube has doubled in length at about the 10 mm. stage, it has extended more and more into the umbilical cord. With further extension into the cord there is a twisting or rotation of the loop which protrudes from the abdomen. If the center or axis of the rotation is considered to be the superior mesenteric artery, then the first step in rotation is 90 degrees in a counterclockwise direction as you face the embryo (64), Figures 14a and b. The proximal limb is depressed to the right and the distal limb is elevated to the left, Figures 15a and b. This state of affairs persists until about the tenth week (18), or when the embryo is about 40 mm. in length. If further rotation of the intestine and return from the cord to the abdomen is arrested at this stage, an omphalocele results. An example of this stage of arrested development in the baby is illustrated in Figure 16. Even before return of the intestines begins, the proximal portion of the loop, that is, the duodenum and jejunum, have begun to swing under the superior mesenteric artery (52), Figure 14c. As the small intestine returns, it normally passes to the left side of the abdomen of the embryo and completes the swing of 270 degrees of the duodenojejunal loop in a counterclockwise direction, as one faces the embryo, Figure 14d.

Now, if the returning small intestine passes through a rent in the mesentery of the descending colon, a left paraduodenal hernia occurs. After the normal return of the small intestine, the cecum drops back into the abdomen on the left side of the embryo, Figure 15b. Almost immediately it straightens out, Figure 15c, which brings it above the superior mesenteric artery and completes 180 degrees of its rotation from left to right as you face the embryo. The final swing of the cecum to the right side of the embryo is soon completed and the process of rotation is at an end, Figure 15d. If the cecal loop fails to complete its rotation the ascending colon and appendix will be on the left side, or if it attaches above the superior mesenteric artery the duodenum may become obstructed by adhesive bands. Failure to rotate results in an unattached mesentery of both the small intestine and the right side of the large intestine. Both of these

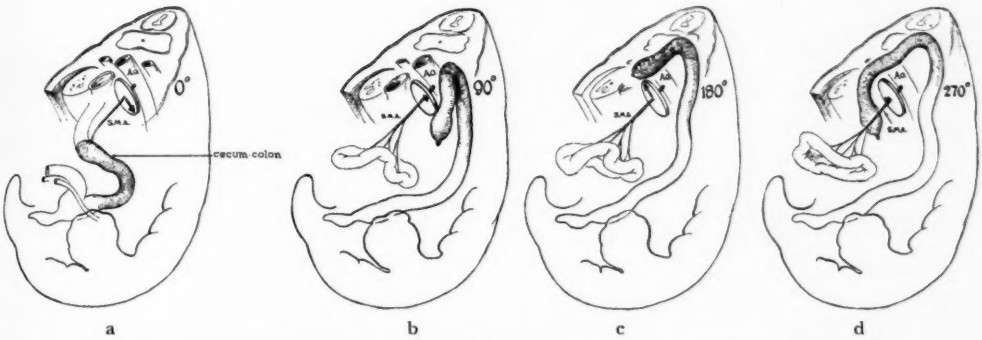

FIG. 15. a, Diagrammatic sketch of the same 5 mm. embryo, indicating the cecocolic loop with a slight bend forward in a position anterior and inferior to the superior mesenteric artery. This is the 0 and initial position of the cecocolic loop, before rotation begins.

b, After the lapse of about 6 weeks' time, or the conditions found in a 40 mm. embryo. The cecocolic loop has dropped back into the abdomen and lies directly to the left of the artery, having rotated through an arc of 90 degrees from its original position.

c, This is also a 40 mm. embryo with the cecocolic loop having partially stretched out and moved to a position superior to the artery, or through an arc of 180 degrees from its starting position.

d, This is still a 40 mm. embryo, showing the final position of the cecocolic loop directly to the right of the artery and indicates the passage of this loop through a further 90 degree arc. Thus, the cecocolic loop has moved in a counterclockwise direction from its original position beneath the artery to the left, above, and to the right, through an arc of 270 degrees to its final position on the right of the artery.

segments may thus become involved in a volvulus with resulting gangrene. One additional abnormality involved is early attachment of the mesentery of the right colon before the colon swings to the right side of the abdomen which results in the inclusion of the small intestine behind or posterior to the mesentery of the right colon, and in obstruction due to a right paraduodenal hernia.

SUMMARY

Surgical management of arrests or errors in embryological development. Omphalocele occurs when the stage of development of the intestines in the cord persists, Figure 16. Normal development of the intestines within the cord has been outlined. This phenomenon continues until the end of the tenth week. A persistence of this state of affairs in the baby is incompatible with life unless relieved by the surgeon whose task it is to complete the stages of development following the arrest, that is, return of the intestines into the abdomen and closure.

Atresia of the intestine, Figure 17, is understandable as a persistence of a section of the intestine in the embryonic state in which the lumen is closed by a proliferation of the cells of the lumen (see Development of the colon and midgut). Removal of this obliterated segment of the colon and connecting the lumen above and below the area is the surgeon's task.

Duplication cysts and duplications of the intestine, Figure 18, are errors in development which may require not only the excision of the cyst but also of the adjacent bowel as well, which may constitute an actual part of the anomalous cyst. In Figure 18B is shown an almost complete duplication of the colon. This type of anomaly, too, may require resection of the adjacent bowel as the walls of the two segments may be incorporated; however, in the condition shown in (Fig. 18B) it may be possible to excise the duplication partially and leave the normal colon intact. The cysts form at about the eighth week of embryonic life as buds which protrude through the bowel wall and may become separate from it. Duplications, on the other hand, develop at an earlier phase, before the sixth week, and result from a coalescence of vacuoles in a double row within the proliferating endothelial cells filling the lumen. Elements of the intestinal wall follow the circumference of the double lumen, resulting in a double segment of bowel.

Imperforate anus, Figure 19, not only includes arrests in the process of opening up the membrane covering the termination of the anus to the

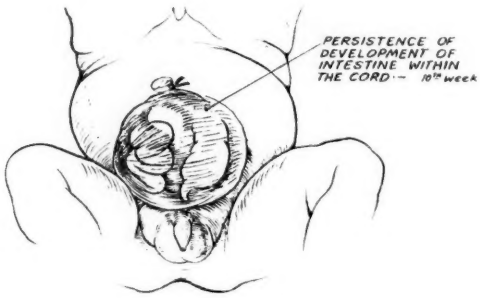

FIG. 16.

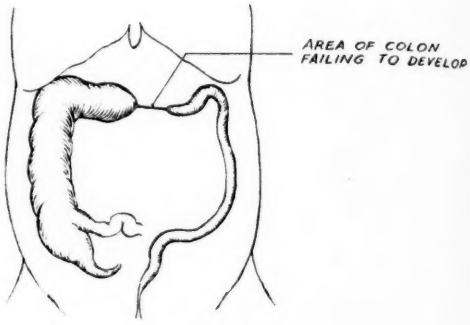

FIG. 17.

FIG. 16. Omphalocele: This diagram indicates the persistence of the intestines within the cord or a failure of these structures to return to the abdomen at about the tenth week of embryonic life. The cecum is shown in its usual position on the right side and the small intestines on the left. The surgeon's task is to return these intestines to the abdominal cavity and repair the remaining defect in the wall.

FIG. 17. Atresia of the colon. An area of the transverse colon which has failed to develop a normal lumen is indicated. When the embryo is but 10 mm. and the intestine only about 2 mm. in length, it is reasonable that if any minute section of the tube fails to develop, this 'atretic' area will contain no lumen. Although this condition is much more frequent in the small intestine, several examples have been reported in the colon. It is corrected by excision of the atretic area and anastomosis of the proximal and distal segments.

outside but also the much more frequent failure of growth of the terminal segment of the rectum and the persistence of a portion of the stage in the embryo in which the genitourinary tract and intestinal tract empty into a common outlet (cloaca, Figure 7). This latter component of the arrested development accounts for the frequent fistulas (Figure 19 A and B) existing between the rectum. bladder, and vagina. Here again the surgeon's task is to complete as closely as possible the stages of embryonic development which nature had left undone: namely, closure of the fistulas and bringing the colon to the anus. The failure of the rectal segment to unite with the anus has been indicated in Figure 19 A as simply one of failure to develop. In Figure 19 B the distal segment of the rectum has been present but has been obliterated by a continuing process which is

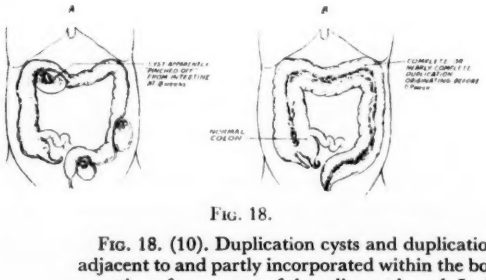

FIG. 18.

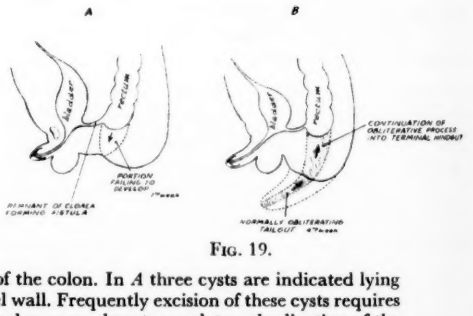

FIG. 19.

FIG. 18. (10). Duplication cysts and duplication of the colon. In *A* three cysts are indicated lying adjacent to and partly incorporated within the bowel wall. Frequently excision of these cysts requires resection of a segment of the adjacent bowel. In *B* is shown an almost complete reduplication of the large intestine (62). It may be possible to resect a major portion of the duplication and keep the remaining colon intact.

FIG. 19. Imperforate anus: These schematic diagrams *A* and *B* indicate the two acceptable theories of the embryonic origin of imperforate anus. In *A* the rectum has simply not descended to meet the anus. In *B* the rectum having once formed in its normal relationship with the anal area has been obliterated by a continuation of the normally obliterating process which takes place in the tailgut. Both diagrams indicate a persisting portion of the area of communication between the rectum and bladder which existed in early embryos, Figure 7, page 315. This anomaly is corrected by ligating and excising the fistula and by anastomosing the remaining portion of the rectum with the anus.

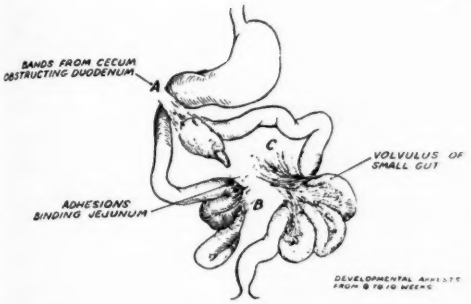

FIG. 20. Malrotation. Malrotation of the intestine, per se, does not cause any abnormality which needs to be corrected; however, it produces three abnormal processes, *A*, *B*, and *C*, which must be corrected by the surgeon. The effects of malrotation are those indicated in this diagram; namely, *A*, bands which attach from the cecum to the right upper quadrant and cause duodenal obstruction; *B*, kinking and adhesions of the first portion of the jejunum which must be freed to relieve obstruction and stabilize the mesentery of the small intestine; *C*, volvulus of the small intestine, the result of a narrow mesenteric attachment of the small intestine in the region of the superior mesenteric artery.

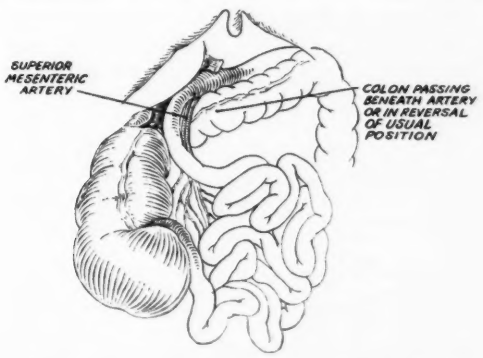

FIG. 21. Reversed rotation. The end result of reversed rotation of the cecum and right colon is indicated. These structures and a portion of the transverse colon lie beneath the superior mesenteric artery. This results in compression of the bowel at this point and obstruction of the transverse colon. An explanation of this (page 318) can be found if one visualizes the right colon returning to the abdomen on the left of the artery and then passing in a reverse direction beneath the artery. This obstruction may be corrected by an anastomosis between the right and transverse colon.

normal in the tailgut but is abnormal when it extends and involves the distal rectum.

Malrotation of the intestine alludes to a failure of one or both of the loops of intestine, which at the start of development lie above and below the superior mesenteric artery, to rotate in a counterclockwise direction about the artery, Figures 14 and 15. This failure to rotate results in three additional abnormal processes, Figure 20 A, B and C, which are important for the surgeon to correct. Bands attaching to the right upper quadrant from the cecum must be severed to relieve the duodenal obstruction. Volvulus of the small intestine, the result of a narrow mesenteric attachment of the small intestine, must be relieved. The adhesions attaching the jejunum in its abnormal position must be freed up to allow for unkinking of the intestines and stabilization of the small bowel mesentery. The malrotation, per se, is harmless.

Reversed rotation. When the ileocolic loop of intestine reverses its normal direction of motion about the superior mesenteric artery after it returns from the cord into the abdomen, it passes in a clockwise direction, as one looks at the embryo, about the artery and comes to lie beneath the artery as indicated in Figure 21. The duodenojejunal loop fails to rotate and so lies above the artery. The pathology produced is one of obstruction of the transverse colon due to pressure of the artery on its anterior surface. The abnormality can often be corrected by a side-to-side anastomosis between the ascending and transverse colon.

Pseudohermaphroditism is an error in development (73) in which the perineum and external genitalia do not conform to the internal sex glands. In the illustration given, Figure 22 A and B, the rectum and perineal body have progressed normally for both sexes. The lateral labial folds

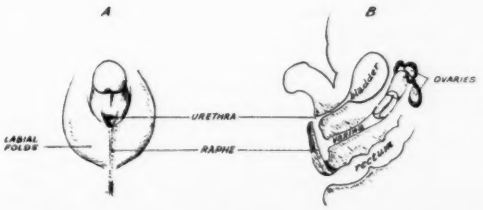

FIG. 22. Pseudohermaphroditism. The suggested male appearance of this female child is indicated in *A*. Labial folds have joined in the midline producing the usual raphe seen in the male. Cross section of this area and the internal structures are shown in *B*. The open space behind the joined labia is considered to be the remaining portion of the urogenital sinus. The rectum and perineal body remain normal. Excision of the raphe with the surrounding tissues and the enlarged phallus would satisfactorily correct this anomaly.

and median raphe have developed according to that expected in the male. However, the external structure covers nearly normal internal female organs, including the vaginal opening, uterus, and ovaries. A plastic procedure (37) could remove the overlying raphe and surrounding tissues and the abnormally large phallus, which would result in a satisfactory surgical correction of the error.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

Bilateral Blepharospasm. MARTIN J. URIST. *Arch. Ophth.*, Chic., 1957, 58: 520.

THE AUTHOR discusses a type of bilateral blepharospasm which usually occurs in patients who are more than 40 years of age. It is of unknown etiology but may be associated with Parkinson's disease. The history would indicate that there is a large psychosomatic component, but this is not true in every case.

The author's cases and those in the literature to which he refers indicate that the disease may appear in a relatively mild form with intermittent spasmodic closure of the lids occurring a few times a minute but in which the patients are able to control the lids so that vision is possible. The severe form of the disease is disabling in that the spasms increase in frequency and duration and there are added spasms of other muscles of the face, including the platysma. In the severe cases, vision is literally impossible since the lids have to be held open.

Almost all forms of treatment have been tried, varying from local anesthetics, sedatives, and tranquilizing drugs given by the general practitioners to surgical procedures performed by the ophthalmologists and neurosurgeons which include resection of the orbicularis, injection of the orbicularis with absolute alcohol, electrocoagulation of the facial nerve, neurectomy of the upper branches of the facial nerve, and division and anastomosis of the facial nerve. Psychiatrists have also given psychotherapy and shock treatment. These treatments are of varying benefit but, for the most part, are not satisfactory.

The author reports on 8 cases of bilateral blepharospasm, 4 of which were not too severe, and 4 very severe. In 3 of the cases, there was a possibility of psychosomatic disease but evaluation showed that psychotherapy was useless in the treatment of the condition. The author's results with injection of alcohol in section of the nerve were similar to other reported cases. He found that there was rapid regeneration of the nerves following both cutting and injection. There also seemed to develop an immunity by the nerve to the effect of alcohol, after a number of injections. Regenerative qualities were phenomenal in that the nerve would regenerate within several months, even after having been cut and the proximal end buried beneath the periosteum of the zygoma. The author describes a new treatment which consists of placing a sling suture between the frontalis muscle and the lid. This was used in 3 cases and gave symptomatic relief.

—*A. V. Mortensen, M.D.*

The Unreliability of Tactile Tension. JAMES E. MACDONALD and WAYNE M. CAYGILL. *J. Am. M. Ass.*, 1957, 165: 1131.

THERE is a widespread belief among the medical profession, including some ophthalmologists, that the determination of ocular tension by palpation through the lids offers a fairly reliable estimation of the level of intraocular pressure for the diagnosis of glaucoma. The authors believe that numerous patients with failing vision undergo irreparable glaucomatous damage to the optic nerve because of undiagnosed glaucoma missed by relying on the tactile method of estimating ocular tension.

As tactile estimation is widely done, this study was conducted to assess its accuracy. Twenty-one different examiners estimated the tension by tactile examination on 524 eyes of known glaucoma patients. For statistical purposes, each examiner gave his estimation in millimeters of mercury. The examiners included 2 full professors of ophthalmology, 3 assistant professors, 3 clinical assistant professors, 4 clinical instructors, 5 residents, 1 intern, 1 resident in medicine, and 2 senior medical students. The findings indicated that the ability to diagnose the tension tactilely with accuracy did not seem to depend on the physician's experience, since authorities in the field did more poorly than the ophthalmology residents. The over-all main deviation based on the number of eyes examined by each physician was 6.8 mm. of mercury. On the range of deviation, all of the physicians averaged an error of 15 mm. of mercury on the high side and 19 mm. of mercury on the low side, on the poorest evaluation of the intraocular tension.

These findings are consistent with the belief shared by the vast majority of ophthalmologists interested in the problem of glaucoma—that tactile tension has a high degree of unreliability. Ophthalmologists with much experience feel that tonometry should be done on all patients more than 40 years of age. Since the prevalence of undetected glaucoma in the population over 40 years of age is 2 per cent, the authors suggest, as have others, that routine tonometry should be part of the general physical examination. The general physician should feel obligated to either take the ten-

sion himself with a Schiotz tonometer or with the new Berens-Tolman screening tonometer, or see that his patients get to an ophthalmologist who will do routine tonometry in the course of an examination for glasses. —*A. V. Mortensen, M.D.*

Management of the Primary Glaucomas. JOHN M. MCLEAN. *Am. J. Ophth.*, 1957, 44: 323.

THE AUTHOR classifies primary glaucoma as angle-closure, open-angle, and a combination of these two types.

Cases of angle-closure glaucoma are divided into four classes, depending on the base pressure, the appearance of the anterior chamber angle, the facility of aqueous outflow, the appearance of the optic disc, and visual field studies. Each class requires a different type of surgery, which is graded according to the severity of the glaucomatous changes.

In Class I cases, all of these factors are normal. The intraocular pressure is controlled medically prior to operation, which is postponed until the acute attack subsides. Either a peripheral iridectomy, a peripheral iridotomy, a complete iridectomy, or an iridodialysis is indicated.

In Class II cases, these factors remain borderline or nearly so. Additional drainage from the anterior chamber is needed. This is accomplished by a peripheral iridectomy with incarceration of the apex of the triangular flap of iris.

In Class III cases, there is moderate impairment. An iridencleisis is necessary.

In Class IV cases, there is severe involvement and either an iridencleisis with a sclerectomy or a double pillar iridencleisis is suggested. A method for performing an iridencleisis is described in which the iris is first torn from the ciliary body, split radially down to the pupil, and the peripheral edges incarcerated beneath the conjunctiva.

Subacute angle-closure glaucoma is basically the same disease as acute angle-closure glaucoma.

Control of open-angle glaucoma is primarily medical, through the use of miotics and aqueous-inhibiting agents. Surgical intervention is necessary if the glaucoma is not controlled medically. Early operation is advocated for patients who do not carry out the proper medical therapy. Tangent screen visual field studies are the most important method of determining the adequacy of treatment. When surgical intervention is necessary, corneoscleral trephination is favored if the angle is wide. If the angle is open but not extremely wide, iridencleisis is preferred.

In those cases in which there is a combination of angle-closure glaucoma and open-angle glaucoma, the angle-closure glaucoma is eliminated by the aforementioned surgery of the iris, followed by medical treatment of the remaining open-angle glaucoma. —*J. Jack Stokes, M.D.*

Total Xerophthalmia. JAMES E. BENNETT and ARBY L. BAILEY. *Arch. Ophth.*, Chic., 1957, 58: 367, 372.

THE TREATMENT of total xerophthalmia has always been an extremely difficult problem. Total xerophthalmia frequently occurs following exfoliative dermatitis, ocular pemphigus, and trachoma, all of which are associated with complete loss of function of the lacrimal gland and accessory lacrimal tissues. Conservative treatment in the past consisted of local use of artificial tears, blocking of the puncta, tarsorrhaphy, and vitamin A therapy and has been extremely unsatisfactory. In the first article the authors define and illustrate a surgical approach to correct this condition by transplanting the parotid duct to the inferior cul de sac of the involved eye. An incision is made over the masseter muscle on the line between the lower edge of the lobe of the ear and the lower edge of the nares. The parotid duct is isolated and freed as it crosses the masseter muscle and is dissected free from its attachments. The entrance of the parotid duct in the mouth is then definitely localized and excised from the mucous membrane of the mouth. This duct is then carried up to the inferior cul de sac of the eye. The buccal mucosal funnel is then sutured into the conjunctiva of the lower cul de sac.

In the second article the same treatment for the condition is discussed with a report of a case with a successful result. Complete details of the operation can be found in the second report. —*Earl H. Merz, M.D.*

Plastic Repair of the Conjunctiva by Peritoneum Transplantation. MANMOHAN MALHOTRA. *Brit. J. Ophth.*, 1957, 41: 616.

THE AUTHOR reports the results of transplantation of peritoneum on to the conjunctiva to fill gaps in the conjunctival sac in 4 cases and the use of slips of peritoneum on the palpebral conjunctiva in 23 cases of entropion. The method used was a modified Webster's operation.

The material used was taken from hernial sacs and the tunica vaginalis from hydrocele sacs. It can be stored for up to 18 days in normal saline solution at 4 degrees C.

On the basis of the results obtained, the author suggests that replacement of the conjunctiva with peritoneum may be undertaken in trachoma and other inflammatory diseases of the conjunctiva and after surgical removal of the conjunctiva in the treatment of neoplasms. It is also suggested that peritoneum might be particularly useful for socket reformation, lid repair or new lid formation, and for repair of the bulbar conjunctiva.

It should be noted that the author's trials were not begun until late in 1956, so it is not yet possible to determine the long term results.

—*A. V. Mortensen, M.D.*

Further Studies on the Viability of Frozen Corneas; as Determined in Tissue Culture. JERRY DRAHEIM, SAMUEL D. MCPHERSON, JR., VIRGINIA J. EVANS, and WILTON R. EARLE. *Am. J. Ophth.*, 1957, 44: 182.

THE AUTHOR presents a follow-up report on viability of frozen animal corneas. The results of a previous study showed viability of all fresh and glycerol-frozen corneas at the end of 48 hours.

The present report shows the corneas stored longer than one month had decreased viability and changes in physical appearance.

The method of preservation was then investigated as well as the best soaking solution. Corneas were placed in 5, 10, 15, 20, 25, 30, 35, and 40 per cent glycerol in Earles' saline solution for 6 hours. It was

found that 10 to 25 per cent concentrates of glycerol in saline solution caused the least damage to the corneas.

The last factor determined was the effect of the rate of freezing on the corneas. It was found that the rate of freezing had little effect on viability but that step freezing caused some cloudiness.

—*Earl H. Merz, M.D.*

Conservatism in the Management of Congenital Cataract. FRANK D. COSTENBADER and DAN G. ALBERT. *Arch. Ophth.*, Chic., 1957, 58: 426.

THE AUTHORS outline a conservative approach to the management of congenital cataract, emphasizing the use of mydriatics and optical iridectomy in certain groups of cataract. One hundred cases of congenital cataract are reviewed. They are divided into five groups according to severity of involvement of the lens.

In Group 1 in which there is bilateral minimal involvement, treatment is usually not necessary. Mydriasis may be used. In Group 2 in which there is a unilateral cataract with severe involvement of the lens in one eye and slight involvement in the other, surgical treatment is not advised unless the cataract becomes hypermature. The use of surgery for monocular congenital cataract is deplored. In Group 3 in which there is bilateral, moderate lamellar involvement, mydriatics such as atropine or homatropine are used and the proper bifocals prescribed. Optical iridectomy is recommended at a later age after which mydriatics may be omitted. Surgical removal of the cataract, when necessary in these cases, is postponed as long as possible and preferably at least until the child is of school age. In Group 4 in which there is bilateral, dense nuclear involvement with clear cortex, surgery is not usually successful, regardless of the type of operation which is performed. Mydriasis is of little value largely because the pupil will not dilate. In Group 5, there is bilateral extensive involvement. Surgery in these cases is done by the first year of life. The authors recommend linear extraction with a complete iridectomy. —*J. Jack Stokes, M.D.*

The Differential Diagnosis of Malignant Melanoma of the Choroid. ALGERNON B. REESE. *Arch. Ophth.*, Chic., 1957, 58: 477.

THIS EXCELLENT REPORT concerns 214 patients who were examined because a malignant melanoma of the choroid was suspected. The cases were divided into 4 groups. Group 1 consisted of the patients who did not have malignant melanoma, but who had a lesion which simulated one; there were 106 patients in this category. Patients in whom a malignant melanoma was diagnosed and this diagnosis later confirmed were placed in Group 2; there were 84 patients in this category. In Group 3 there were 10 patients in whom an incorrect clinical diagnosis was made as proved by the subsequent course or microscopic examination. The fourth group was made up of 14 patients who were lost to follow-up.

The author lists the simulating lesions in the order of their frequency as follows: inflammation, macular degeneration, benign melanoma of the choroid, metastatic carcinoma, serous detachment of the retina, benign melanoma of the retinal pigment epithelium, hemorrhage, hemangioma of the choroid, Coats's disease, cyst of the macula, congenital crater of the optic disc, and angioid streaks. Fifty per cent of the lesions diagnosed as inflammatory showed edema residues or inspissated edema at some site in or around the lesion. This is never seen in a melanoma. Inflammatory lesions also showed active hemorrhage in about 50 per cent of the cases, primarily occurring as a collarette. In melanomas, hemorrhage plays an inconspicuous part and when present is usually over the surface of the lesion. Another important diagnostic point was that 25 per cent of the inflammatory lesions showed some evidence of a similar process in the opposite eye.

Most of the cases of macular degeneration were of the disciform type and about 50 per cent of these lesions showed some associated edema residue in or around them. One third showed sufficient pathologic change in the macular area of the other eye to give confirmatory evidence. In cases of benign melanoma of the choroid, scotomas were difficult to elicit and smaller than might be expected from the size of the lesion. This is contrary to cases of malignant melanoma in which, even when small, a scotoma is easily elicited which is larger than the size of the lesion would indicate.

The author feels that the most helpful aid to correct diagnosis is retroillumination of the lesion to determine whether light is transmitted. The test consists essentially of viewing the lesion through a well-dilated pupil while a very bright light is thrown below its lower margin by means of the ophthalmoscope. It is important to move the head and the light until the reflected rays from the choroid reach the examiner's eye. This cannot be carried out satisfactorily unless the light can be placed below the suspected lesion. If the lesion is a melanoma, the reflected rays do not penetrate the lesion and, therefore, its border is seen as an opaque or dark zone. Other valuable signs, pointing to melanoma, are light brown or tan pigmentation over the tumor. In 20 per cent of the melanomas studied an abnormal vascular pattern, suggestive of vascular channels or blood sinuses, was present over the surface of the tumor. In about one third of the cases, there were acquired or dilated episcleral vessels corresponding to the site of the tumor. Confirmatory signs were drüsen bodies and mushroom shape of the lesion. Equivocal findings are hemorrhage, tenting, and a dependent serous detachment of the retina. Residual edema favored the diagnosis of a non-neoplastic process. It is suggested that this paper be read in its entirety. —*A. V. Mortensen, M.D.*

Retinal Vascularization in Health and Disease: Proctor Award Lecture of the Association for Research in Ophthalmology. NORMAN ASHTON. *Am. J. Ophth.*, 1957, 44: 7.

THE AUTHOR presents in this lecture the experimental work which he and his associates have done on retinal vascularization.

In normal retinal vascularization the mode of development is fairly well known. The budding off of the retinal vessels is preceded and accompanied by clusters of undifferentiated cells derived from the

vessel wall. They contain glycogen and are responsible for the formation of the entire retinal vasculature.

The formation of retinal capillaries is pre-eminently a function of retinal veins. A capillary-free zone exists around the arteries.

The pattern of vascular growth suggests possible association with the level of oxygen tension. A vasoformative factor arises in areas of lower oxygen tension.

There seem to be two clearly defined processes in the growth: one of inhibition, as evidenced by vasoobliteration occurring in high oxygen concentration and one of stimulation, as evidenced by vasoproliferation occurring in low oxygen concentration.

The effect of oxygen is rapidly reversible when vessels are still able to reopen. It becomes irreversible when the vessel has been closed so long that the walls are adherent.

Vasoproliferation is always proportional to the degree of vaso-obliteration. When irreversible vasoobliteration is prevented, vasoproliferation does not occur although the animal is exposed to the same concentration and period of hyperoxia.

So the author concludes that the factor which stimulates the growth of vessels in the retina is formed in hypoxic tissue and probably derived from products of anaerobic metabolism. —*Earl H. Merz, M.D.*

Vitreous Changes and the Mechanism of Retinal Detachment. C. C. Teng and H. H. Chi. *Am. J. Ophth.*, 1957, 44: 335.

There are two types of vitreous liquefaction. In the first type, liquefaction starts from the central core of the vitreous and extends into the periphery. There is no posterior detachment of the hyaloid membrane. The second type is characterized by anterior contracture of the solid portion of the vitreous, leaving the posterior portion in a liquid form. There is usually posterior detachment of the hyaloid membrane in this type.

There are also two types of vitreoretinal adhesions. Senile peripheral vitreoretinal adhesions form a band around the periphery of the retina. A local vitreoretinal adhesion is a small patch of retina which adheres to the vitreous in any part of the eye, and is due to congenital rosettes and folds in the retina. These rosettes detach from the retina and leave either a degenerated spot or a hole in the retina.

The three principal factors of retinal detachment are posterior detachment of the vitreous, vitreoretinal adhesion, either senile or local, and motion. In the presence of posterior detachment of the vitreous (type II liquefaction of the vitreous) and senile or local vitreoretinal adhesions, motion precipitates a retinal detachment. Movement of the eyeball causes movement of the vitreous and this movement exerts traction at any point of vitreoretinal adhesion. The shape of the tear may depend on the type of vitreoretinal adhesion, whether local or senile. After the retina is torn, subsequent motion tends to elevate the retina, allowing the fluid vitreous to migrate beneath it. Secondary tears or enlargement of the primary tear occur.

The degree of detachment of the hyaloid membrane may be used as a guide for beginning treatment. When the detachment reaches the vicinity of the local vitreoretinal adhesion, diathermy may be necessary to prevent further detachment of the vitreous and of the retina. Any retinal hole should be sealed by diathermy to prevent fluid vitreous from getting behind the retina. The presence of type II liquefaction of the vitreous and a retinal hole or tear is an indication for surgery. Vitreous implantation is extremely valuable because it pushes the contracted vitreous and retina back but the vitreous should be injected in the central portion of the contracted vitreous and not behind it or else it will merely push the hyaloid membrane forward and produce greater traction at the site of vitreoretinal adhesion. —*J. Jack Stokes, M.D.*

Improvement in Hypertensive Retinopathy Following Adrenal Resection and Sympathectomy. William C. Frayer. *Arch. Ophth.*, Chic., 1957, 58: 331.

A report on the retinal changes in 111 hypertensive patients that have had total or subtotal adrenalectomy combined with a sympathectomy is presented. The retinal findings were used as a criterion for analyzing the improvement or lack of improvement from the therapy of the 111 cases. Improvement in the retinopathy was noted in 78.4 per cent of the cases. All patients with grade 4 disease showed improvement and 92 per cent of the patients with grade 3 hypertensive retinopathy showed improvement. It was thought that the improvement was the result of diminished peripheral resistance and an improvement in the retinal blood flow. —*Earl H. Merz, M.D.*

EAR

Chronic Ear Infections. Julian Bihari. *Brit. M. J.*, 1957, 2: 623.

Thirty-four patients with chronic ear infections (otitis externa, chronic suppurative otitis media, or infected mastoid cavities) were treated by the topical application of a solution containing neomycin, polymycin, and hydrocortisone in an aqueous base. Thirteen patients were cured (remaining symptom-free for at least 9 months), 19 were improved, and 2 remained unaffected by the treatment. The most satisfactory response occurred in the patients with otitis externa. No toxic or sensitizing reactions were encountered in the series.

—*John R. Lindsay, M.D.*

Mobilization of the Stapes in Otosclerosis by a Transtympanic Technique. Lucian W. Alexander. *Arch. Otolar.*, Chic., 1957, 66: 383.

The author gives a brief report of the historical background of mobilization of the stapes. He quotes the excellent report of Kos in relation to the indications for the operation. His experience with 75 mobilization operations has led the author to the following conclusions.

He uses a technique similar to the one described by Rosen and he is opposed to direct mobilization of the footplate because of the possibility of labyrinthitis and a hearing loss of irreversible character. The advantages of this operation over the fenestration are: (1) that it is a relatively minor operation which can be performed under local anesthesia within 35 to 45 minutes; (2) the lack or mildness of postoperative vertigo; (3) the simple and uncomplicated postopera-

tive care; (4) the short postoperative period, and the possibility of a second operation if the first one fails.

The author quotes Rosen and Bergman as to the three main reasons for possible failure: (1) the footplate is so firmly fixed that it does not yield to pressure; (2) the crura are so thin and fragile that they fracture under the application of the force required to mobilize the footplate; and (3) faulty technique.

The author believes that surgical mobilization of the ankylosed stapes has sound rationale behind it in that it attacks directly the pathologic process responsible for otosclerotic deafness. It is not a substitute for the fenestration operation, and comparison of the two procedures is not valid. Fenestration can be performed without jeopardizing its chances of success if the mobilization operation fails or if the improvement secured by it is not maintained. The patient's best interests are therefore often served by a preliminary trial of the simpler operation before fenestration is resorted to. This is not a procedure which should be attempted by a surgeon who has not had careful training in it.

Although mobilization of the stapes is still on trial because it has been employed for such a short time, there is no doubt of its usefulness and value at this stage of otologic progress. —*G. Obregon, M.D.*

MOUTH

Dental Extraction in Hemophilia. C. WISHART, C. ANNAND SMITH, G. E. HONEY, and K. B. TAYLOR. *Lancet*, Lond., 1957, 2: 363.

BLEEDING after dental extractions can be prevented in hemophiliacs by large transfusions of fresh plasma and the application of dental splints. Before the extractions, a molded splint of acrylic resin is made to fit over the empty sockets which will remain after the surgery. The splint allows gentle pressure to be exerted on the margin of the gums and prevents the clot, forming after extraction, from being dislodged. The plasma from four pints of blood is transfused one hour before surgery at such a rate that the transfusion is completed as the extraction (under light general anesthesia) is started. Before application the splints are lined with calcium-alginate gauze which has been soaked in Russel's viper venom; they are left in place for 7 days, during which time one liter of plasma may be given daily. The technical details of preparing the splints are described, as are the author's results with 16 hemophiliacs who required transfusion.

—*John R. Lindsay, M.D.*

Salivary Gland Tumors and Miscellaneous Associated Problems. JOHN C. GAISFORD and DWIGHT C. HANNA. *Plastic & Reconstr. Surg.*, 1957, 19: 458.

THE AUTHORS studied 156 cases of tumors of the salivary gland. First they analyzed their cases of tumors of the parotid gland and developed their own classification, analyzing the clinical aspects in each group. Their study comprised 125 parotid conditions, the most frequent being benign mixed tumors, benign cysts, Warthin's tumor, and sialadenitis. These types of benign tumors account for about 78 per cent of their cases and the benign mixed tumors and benign mucoepidermoid tumors account for 47.2 per cent. The different types of malignant tumors were found in 22.4 per cent of their cases.

The authors did not advise the use of sialography because they believe this procedure does not give them enough information to warrant its use. They advocate an incisional biopsy at the time of surgery with immediate frozen section. They strongly advise against routine local excisions for parotid tumors because of the high percentage of recurrence.

In the series of parotid tumors 59 were found in the superficial lobe and 21 in the deep lobe. For removal of parotid tumors they advocate the use of a Y type of incision with wide elevations of skin flaps, location of the peripheral branches of the facial nerve at the anterior edge of the gland, and retrograde dissection of the nerve. This is the procedure that the authors recommend for the tumor not requiring a radical excision.

Total parotidectomy with preservation of the facial nerve is done for the malignant mixed tumor, mucoepidermoid carcinoma, cylindromatous carcinoma, and acinar cell carcinoma. The facial nerve is sacrificed if it is adherent to the tumor or definitely involved in the tumor. If there are suspected cervical metastases, a node is removed for a frozen section. If tumor is present in the node, a complete radical neck dissection is performed in continuity with the parotid excision.

A total parotidectomy and complete radical neck dissection is done for squamous cell cancer and the undifferentiated cancer. Frequently the nerve must be sacrificed in these cancers.

X-ray therapy is advocated in cases of lymphosarcoma and Hodgkin's disease and also in cases of cancer too far advanced for surgery. In these series there were 15 cases of submaxillary gland tumors, 12 of which were malignant and 3 benign. Chronic sialadenitis was found in 5, associated with stones in 3. The tumors found in order of frequency were: benign mixed tumor 3, malignant mixed tumor 3, adenocarcinoma 2, mucoepidermoid carcinoma 2, lymphosarcoma 2, Hodgkin's disease 1, reticular cell sarcoma 1, and cylindromatous carcinoma 1. Tumors of the submaxillary gland are best treated surgically after an aspiration biopsy or a small wedge biopsy studied in frozen section. Benign tumors are excised locally and malignant tumors require a complete radical neck dissection. On occasions resection of the jaw may be included in the initial treatment. Only one case of sublingual gland tumor was seen and this was an adenocarcinoma.

In this series there were 9 cases in children, 5 were tumors and 4 were chronic infections. Of the 4 parotid tumors, 2 were malignant and 2 were benign. One was a submaxillary gland tumor which proved to be a mucoepidermoid carcinoma in a 12 year old girl. The salivary gland tumors in children must be surgically explored for it is evident that a number of them are malignant. The authors recommend local excision of the affected gland in chronic sialadenitis. In their experience it is seldom possible to remove a single stone and expect a cure. Technically they believe it is more difficult to remove this type of gland than one involved by tumor. They advocate preservation of the facial nerve at any cost in a benign mixed

tumor. However, when the facial nerve is definitely invaded by tumor it is felt that it should be sacrificed. Prolonged surgical trauma to the facial nerve can cause temporary or permanent paralysis, but in their experience there has never been a permanent paralysis when the nerve was intact at the completion of the surgery. The longest temporary paralysis in their series was one that lasted 6 months. Whenever the facial nerve has to be sacrificed the authors advocate the use of a free nerve graft from the cervical plexus. The insertion of fascial slings, at times in conjunction with rhytidectomy, frequently gives a desirable result. Emphasis is placed on a careful preoperative discussion with the patient preliminary to extensive or possible extensive surgery about the head and neck.

—*G. Obregon, M.D.*

Replantation of the Mandible in Cancer Surgery. Robert L. Harding. *Plastic & Reconstr. Surg.*, 1957, 19: 373.

In patients subjected to cancer surgery in whom a partial resection of the mandible is necessary, it is important to maintain stability of the mandible and pharyngeal funnel following the operation. One method which can be used in selected cases is to prepare devitalized anatomical bone splint by salvaging the resected bone, cleaning out the diseased portion, and then sterilizing the residual bone in the autoclave. This splint is then fixed to the retained segments of the mandible. It has the proper shape and strength for replantation and stability, provided enough normal bone remains in the specimen to give mechanical support. The splint then seems to act as a tolerated foreign body; it becomes surrounded by a fibrous capsule, and is resorbed slowly over a long period of time.

To utilize this method successfully several prerequisites should be fulfilled. First, it should be possible to close the opening in the mouth and still have a soft tissue sleeve in which the bone splint will fit. When the patient has an epidermoid carcinoma that invades the mandible, considerable soft tissue about the primary tumor is usually sacrificed as well as the regional lymph nodes and part of the mandible. It may not always be possible to obtain a satisfactory soft tissue closure to cover the splint in the mouth, and in such a case it is probably better to use a pin. Secondly, there must be enough normal bone left in the resected portion of the mandible so that it can serve as a mechanical strut.

This splint has the proper shape and strength for reimplantation and stability. It has been helpful in cases in which the symphysis has been lost, since if the tissues of the chin are allowed to collapse they become so contracted it is impossible to build them up to their original shape again unless additional soft tissue is transplanted from a distant donor site.

In following the course of this splint with serial roentgenograms slow resorption of the bone has been noted. There has been no x-ray evidence of union between the devitalized and the host bone. Although one would expect considerable mobility at the non-union sites, the mandible has remained quite stable. The stability is probably due to reinforcement by the dense fibrous tissue about the splint. The longest period of follow-up has been 3 years, and although there is considerable resorption and nonunion, the mandible in this patient is still surprisingly stable. It supports a denture and permits fairly heavy chewing. There is no reason why the devitalized bone in this instance cannot be replaced with a living autogenous bone graft.

—*John J. Ballenger, M.D.*

PHARYNX

Modern Views on Passavant's Ridge. James Calnan. *Brit. J. Plast. Surg.*, 1957, 10: 89.

Modern views on the occurrence of Passavant's ridge and its importance in speech have been examined in detail, and extensive quotations have been taken from the works of previous investigators. The ridge has been found to be of muscular origin but the muscle responsible for it has not yet been determined, because dissections of the region have not been made in subjects in whom, during life, this formation was known to have occurred.

There is abundant evidence that while it may be seen in patients with cleft palate (32 per cent of the author's cases), Passavant's ridge plays very little part in obtaining competent nasopharyngeal closure. In the normal human being this ridge is not required for closure of the isthmus during speech, and is present only infrequently. It must be distinguished from the general forward movement of the posterior pharyngeal wall which occurs during swallowing.

The ridge appears to be related to effort in closure of the nasopharyngeal isthmus, for it is more often seen during swallowing, gagging, and blowing than during speech. When it appears during speech in normal speakers, it plays no part in closure of the nasopharyngeal isthmus; and it is too low to contact the elevated soft palate, for the latter elevates to a level above that of the hard palate during speech. The ridge, moreover, moves too slowly, is too inconstantly present, and too easily fatigued to be of essential importance in the normal speech mechanisms.

—*John R. Lindsay, M.D.*

Pharyngeal Fistulas; Repair and Prevention Using Mastoid-Occiput Based Shoulder Flaps. Anthony Zovickian. *Plastic & Reconstr. Surg.*, 1957, 19: 355.

Fistulas of the pharynx occur in the course of treatment by surgery or radiation of cancer in the oral cavity or the throat. More often they are complications of surgical treatment after irradiation has already been tried in an attempt to eradicate the primary cancer.

The inability to swallow, the constant efflux of salivary secretions, and the hazard of aspirating these secretions when a tracheostomy is present make this a very troublesome, if not unbearable, condition. Secondary healing can occur after some time, but stricture of the pharynx or cervical esophagus may follow. Hemorrhage, appearing unexpectedly and intermittently, may further complicate the picture until the fistula is closed.

After a brief review of the historical background the author describes a "mastoid-occiput" type of shoulder flap for the repair of these defects.

Surgical Technique. For greater accuracy, the flap is outlined with the patient sitting erect. The anterior

margin is outlined from the mastoid process along the edge of the trapezius muscle. This margin will then lie within sound tissue which is immediately adjacent to the posterior limits of surgical dissection and the irradiation portals that are ordinarily used. The flap is outlined with enough width so that it will overlap the opening of the fistula by at least two inches and replace most of the cervical skin that is affected by irradiation and surgery. The average required width varies from 4.5 to 5.5 inches. For this much width, the superior pedicle must extend to the midline of the neck and just below the occiput. The posterior margin of the flap lies behind the shoulder. The distal free end may terminate over the deltoid region if extra length is required. If it is believed that lining by skin graft is necessary, the location and size of this patch should be determined and marked at this time.

The flap is prepared in two operative steps 7 to 10 days apart. In the first step, the posterior edge and a part of the distal end are incised. The entire bed of the flap is then undermined. The deep fascia overlying the muscles is raised with the flap. The lining is provided by skin graft at this time. The donor site directly underneath this lining is also grafted, thus creating a pocket lined with skin. This procedure may be done under local or general anesthesia. The second step consists of incising the anterior edge and the remaining free end of the flap. This is most easily done under local anesthesia.

Successful transfer of the flap is possible 14 to 21 days after the last of the two preparatory operations. At this time, proper position of the patient is necessary so that the entire operative field is accessible. The attachment of a cerebellar headrest to the standard operating table is helpful. The patient can then be placed in the supine position with his shoulders away from the edge of the table and with the entire circumference of the neck exposed.

Six case reports with 9 illustrations are included.

—John J. Ballenger, M.D.

NECK

Unusual Findings in Parathyrotoxicosis (Besondere Befunde bei der Parathyreotoxikose). W. H. MINDER. *Schweiz. med. Wschr.*, 1957, 87: 667.

TUMORS of the parathyroid glands, usually responsible for Recklinghausen's disease or generalized fibrous osteitis, may also create more poorly defined clinical pictures. The recognition of such rare symptom complexes is important because in not too far advanced conditions surgical removal of the tumor is a lifesaving procedure.

The author reports 3 cases of hyperparathyroidism in which the diagnosis was confirmed by postmortem examination. In all 3 patients the following symptoms were observed: polydipsia, polyuria, recurrent vomiting and abdominal pains, impaired peristalsis, fatigue and asthenia, apathy, and in terminal stages fever, coma, shock, oliguria, and increased urea in the blood. The symptom complex comprising intractable vomiting, asthenia, oliguria, lethargy, and collapse is usually ascribed to an acute exacerbation of hyperparathyroidism or so-called parathyroid crisis. The author found numerous thrombi in all 3 cases and he considers predisposition to thrombosis a little known but important complication of hyperparathyroidism. This inclination to formation of thrombi is probably due to anhydremia, circulatory insufficiency, calcium deposit in the walls of blood vessels, and hypercalcemia.

—Joseph K. Narat, M.D.

Pathologic Analyses and Prognosis of Tumors of the Head and Neck; a Review of 1,094 Cases at the UST Hospital. ELIAS E. PANTANGCO and LEON V. CASALS. *Philippine J. Cancer*, 1957, 1: 41.

OF 13,742 surgical pathologic specimens studied at the University of Santo Thomas Hospital (Philippines) from 1946 to 1954, there were 1,094 neoplasms of the head and neck. During the same period there were 433 head and neck lesions which were inflammatory in origin.

Cancer of the oral cavity comprises 10.5 per cent of all cancers among Filipinos and ranks second to cancer of the breast (16.2 per cent) in frequency. Tumors of the oral cavity accounted for 26 per cent of the neoplasms of the head and neck in this series. Many of these lesions were classed as betel nut or buyo carcinomas, occurring in patients who chewed a mixture of buyo leaf, betel nuts, and lime.

Tumors of the thyroid were second in frequency to those of the oral cavity. Of 375 thyroid specimens 164 were classified as benign adenomas and 46 (12 per cent) as carcinomas. Papillary adenocarcinomas predominated.

Malignant tumors of the skin represent only 5.7 per cent of all cancers in Filipinos and 13 per cent of all cancers of the head and neck in this series. This incidence is considerably lower than that in the United States, which is explained by the abundant melanin in the skin of Filipinos that shields them from the carcinogenic effects of equatorial solar radiation.

Tumors of the nasopharynx accounted for 2.4 per cent of the neoplasms of the head and neck. This incidence is considerably lower than that reported for the Chinese, but is higher than that in the United States. Tumors of the larynx were uncommon, comprising only 1 per cent of the total series.

Despite the high incidence of tuberculosis in the Philippines any patient complaining of a lump in the neck, particularly if he is over 50 years of age, must be considered to have cancer until it has been proved otherwise.

—Harvey W. Baker, M.D.

Experience with the Combined Operation for Cancer of the Head and Neck. DAVID LYALL and WILFRID A. CLOUTIER. *N. England J. M.*, 1957, 257: 306.

A STUDY of 60 cases of carcinoma of the neck which were treated by resection of the mandible combined with some kind of neck dissection is presented. Many of these cases were far advanced and the operation was performed not with intent to cure but as a remedy for pain.

The majority of these cases were squamous cell carcinomas. The location of various carcinomas determines the rate of growth and the degree of metastasis. Primary squamous cell carcinomas arising on the mandible remain localized for longer periods and metastasize to cervical lymph nodes much later than carcinomas arising on the tongue, the floor of the

mouth, the tonsil, or the buccal mucosa. Carcinomas spreading to the mandible secondarily present a different problem because in more than 50 per cent of these cases there is cervical lymph node involvment even though, clinically, the lymph nodes are not enlarged. In this latter case surgical removal of the cancer field in continuity must be carried out. It is thought that the so-called "pull-through" operations for removal of cancer of the floor of the mouth in which the mandible is left intact do not remove the cancer cells adequately as they may be left on the intact mandible.

The cases studied in this series fall into three categories. One group includes carcinoma localized to the mandible but considered too extensive for segmental resection. The second group comprises advanced intraoral cancer with clinical evidence of cervical lymph node involvement. Group three includes cases of neoplastic disease arising outside the oral cavity but invading the soft tissues of the neck.

The technique employed is a modification of the Crile radical neck dissection. Adequate exposure is obtained by extending the horizontal incision well past the midline. The resection is carried out including the lateral portion of the mandible. Fixation of the resected ends of the mandible is obtained by an ordinary stainless steel Kirschner wire which is shaped and "bayoneted" and then inserted into prepared drill holes in the remaining mandible. This wire lies between the mucous membrane and the skin. It tends to keep the bone fragments apart and thus prevent alterations in bite and forward and inward displacement of the proximal jaw fragment due to the unopposed pulls of the temporal and pterygoid muscles. The aim is to keep this wire in place for 6 to 8 weeks until cicatrization has taken place. When removal of this wire is necessary, it is done intraorally under local anesthesia. A small central incision is made through which the wire is cut and the two ends removed. Bone grafting is not attempted for a period of 12 to 18 months. Closure is obtained by suturing the lingual mucosa to the buccal mucosa. Drainage is obtained by placing a No. 16 Fritsch catheter through a stab wound in the lower flap and connecting it with a suction apparatus for 48 to 72 hours. Tracheostomy is performed to ensure an adequate airway postoperatively.

In these patients the average age was 63 years. There were 54 males and 6 females. There were 4 operative deaths of which 2 were thought to be preventable. Nonfatal complications totaled 26; these ranged from strictures, fistulas, infection, and hemorrhage to embolus, pneumonia, and atelectasis.

The authors did not consider that the figures on survival were encouraging. In 15 cases the lesions promptly recurred without significant palliation. These 60 cases of cancer of the head and neck in which combined surgical procedures have been performed since 1947 were considered advanced at the time of surgery. Twenty five cases survived less than 5 years (7 are still living and free of disease); 35 survived for more than 5 years of which 7 (20 per cent) are still living and free of disease. Of the 46 cases considered curative failures, 2 were lost to follow-up study, 4 had operative deaths, 7 died from intercurrent disease without cancer, 26 died from cancer, 3 died from intercurrent disease with cancer, and 4 are alive with recurrence. —*James M. Brooks, M.D.*

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Prognosis in Posttraumatic Epilepsy. A. E. WALKER. *J. Am. M. Ass.*, 1957, 164: 1636.

THIS REPORT is based on a 10 year follow-up of a series of 246 soldiers treated at the Army Posttraumatic Epilepsy Center at the Cushing General Hospital in Framingham, Massachusetts. The article is most interesting since there are very few such long term evaluations with regard to the posttraumatic convulsive state. It was found that the death rate in this group was two or three times greater than in the general population. Although it was difficult to assess the cause, at least 4 died during a convulsive seizure, and 8 patients died as a late complication of infections from head wounds.

Of exceptional interest is the correlation of the work status of the men with posttraumatic epilepsy. It was found that there was comparatively little correlation with the number of seizures but rather with the basic intelligence of the individual. The I.Q. was determined by the Wechsler-Bellevue intelligence scale. Of 38 patients with I.Q.'s above 110 only 6 were unemployed, whereas of 76 men with I.Q.'s below 90, 65 were unemployed.

More than one-third of the patients were free of attacks between the fifth and the tenth year after the injury. This could not be completely correlated with the type of therapy since more than half of the men were not taking any drugs. Although those patients that had been subjected to cortical resection for control of seizures did no better than the group as a whole, it must be realized that these patients were probably the more severely afflicted and were subject to more frequent seizures originally. The most favorable prognostic factors were "early cessation of attacks, low frequency of attacks, and strangely, severe neurological deficit."

Total disability could not be correlated with either the degree of hemiplegia or epilepsy nor the sum of the two. Such individuals are suffering from a much more complex disability based more on the personality of the individual and an insufficient drive, whether it be intellectual or physical, since many of the patients had no convulsions for several years and no discernible neurological deficits. It is suggested that a more equitable means of compensating such patients would be by a long term insurance policy which would compensate the patient after a period of years, depending upon the seizures at that time rather than upon the evaluation within the first year or two after injury. —*Jack I. Woolf, M.D.*

Subdural Empyemas. E. PEYSER. *Ann. Surg.*, 1957, 146: 215.

FOLLOWING a brief review of the literature on subdural empyema the author presents in tabular form a summary of 8 cases of subdural empyema; 3 of the patients died and 5 recovered. The primary infection was chronic otitis and mastoiditis in 4 cases. Frontal sinusitis, trauma of the frontal bone, and an infected scalp were responsible for 3 cases, and an abscessed lower jaw from an infected tooth was responsible for the eighth case. Whereas the primary infections were often present for long periods of time, the symptoms of subdural involvement were a matter of days, or maximally, 3 weeks. All patients presented serious disturbances of consciousness and lateralizing signs, including Jacksonian seizures in 4. All patients had increased cranial pressure. Diagnosis was established by an exploratory burr hole over the diseased hemisphere.

The author reviews the pathogenesis of subdural empyema which develops: (a) by continuity of spread from the neighboring infection, (b) extension of infection by retrograde thrombophlebitis, (c) attainment of the subdural space by way of small venous channels, (d) metastatic infection of the subdural space, or (e) direct implantation into the subdural space. The author calls attention to the role of the air-filled spaces of the skull as the site of primary infections leading to subdural empyema.

Differential diagnosis includes brain abscess which is a more frequent complication of the same type of primary infection that may lead to subdural suppuration. The history and clinical findings of these two processes may be similar and the various diagnostic methods, including angiography, will be needed; but the final confirmatory diagnostic step is the placement of an exploratory burr hole. The cerebrospinal fluid is under increased pressure with a cell count up to several hundred. In 3 of the author's cases the pus from the subdural collection was sterile; in 2 a Proteus organism was obtained, in 1 a micrococcus, in 1 an Alcaligenes and in the last a Staphylococcus aureus.

The author, after a discouraging experience with attempting to drain the subdural space by multiple burr holes, recommends that after the exploratory burr hole has confirmed the findings, the reflection of a large bone flap, removal of the latter, irrigation of all portions of the subdural space with antibiotics, and removal of the pyogenic membranes, as thoroughly as possible without injuring the deeper pia-arachnoid barrier, be done. In therapy, the scalp is closed; rubber tubes covered with soft Penrose drains are left in the subdural space for additional antibiotic instillation.

Repeated lumbar punctures were performed to provide adequate decompression of the intracranial contents. Cranioplasty was utilized one year after all signs of infection had subsided.

—*W. Eugene Stern, M.D.*

Intracranial Aneurysms Complicating Pregnancy. REX BLEAKNEY. *South. M. J.*, 1957, 50: 1168.

INTRACRANIAL ANEURYSMS complicating pregnancy must be differentiated from causes of complaints such as syncope, vertigo, or headache, which may occur during the course of pregnancy. From a review of the literature the author suggests that 40,000 unsuspecting

members of our pregnant population might harbor potentially dangerous aneurysms. The times when rupture of an aneurysm during pregnancy might be expected would be (1) during the time of greatest increase in blood volume, namely the seventh month; (2) on straining, with the expulsive "bearing down" forces during the second stage of labor; (3) when the uterus suddenly contracts following the end of the third stage, and (4) in the presence of any condition which might raise intracranial blood pressure such as toxemia or hypertensive vascular disease. However, in a survey of the literature, no case has been uncovered of proved rupture occurring during labor. Rupture has occurred after the liberal use of oxytocics in postpartum bleeding. It is noteworthy that few of the cases reported in the literature are confirmed by angiography or by autopsy. The author emphasizes that the diagnosis of intracranial aneurysm must not await the development of a severe picture of convulsions or hemiplegia, but rather that the less dramatic diagnostic signs employed by those who are on the lookout for these processes are sufficient. Six case reports are presented.

It is the author's opinion that the complication of subarachnoid hemorrhage should be treated and the pregnancy be allowed to continue unless there are existing obstetrical reasons to the contrary. In the first trimester there should be no thought of therapeutic abortion in the absence of any other complicating factors. During the second trimester the lesion should be treated directly and the pregnancy permitted to progress normally. The same should be true in the third trimester with the exception that if labor supervenes following the discovery or rupture of the aneurysm the patient should be allowed to deliver before neurosurgical intervention, unless the condition of the patient is clearly worsening. With this in mind the author recommends that every means should be made to establish the diagnosis and institute treatment before the third trimester. In delivering the patient from below, the author prefers caudal or pudendal block, but he states that if there has been no depression of the central nervous system and no recent bloody spinal fluid there would be no particular contraindication to inhalation or saddle block anesthesia.

—*W. Eugene Stern, M.D.*

Epidural Hematoma (Epidurale Haematome). R. Streli. *Klin. Med., Wien.*, 1957, 12: 197.

The author reports experiences with 25 cases of extradural hematoma observed in the Industrial Accident Hospital of Linz (Austria) in the 6 year period ending December 31, 1956. No reference is made to the percentage of success or failure. Emphasis is placed upon the criteria which appeared to be diagnostically the most reliable, and the author cites several points of surgical technique which he found especially valuable.

Initially he expresses appreciation for two factors apparently well controlled in his locale: a well organized system for the prompt transportation of serious head injuries to the hospital, and local practitioners who are alert for the observation of the "lucid interval" and of neurological deficits in cases presenting head injury.

His experience with the lucid interval has been the usual one. He stresses its positive significance in suggesting the diagnosis when it is observed, but hastens to confirm that its absence does not militate against the diagnosis. In 6 of his 25 cases the phenomenon did not appear, and in another 7 its presence or absence could not be established, either because of a significant period without observation or an uninterrupted state of coma. In several cases in which it was observed, the "lucid" period was one of confusion or even stupor, which then reverted to a lesser state of consciousness.

Contralateral hemiparesis, partial or complete, was present in 13 cases and constituted a valuable diagnostic and localizing sign. In 7 cases there was no demonstrable paresis, and in 5 others lateralization could not be determined.

A dilated pupil ipsilateral to the extradural bleeding was observed in 8 cases. In these cases the pupil was either unreactive to light or sluggishly reactive. Three of the 17 in which pupillary size and reactivity were not of value were cases of bilateral hematoma.

Of particular interest are the author's observations on fracture of the skull. Fracture was verified, at surgery or autopsy, in 24 of his cases, and was present on the side of the hematoma in all of these. X-ray films revealed the fracture in 17 cases, but the actual extent was usually greater than the films suggested.

Of other lesions which might be confused with extradural hematoma, the author selects, as most important, cerebral contusion, intracerebral hematoma, and fat embolism (in cases with associated long bone fractures). In addition these may occur along with extradural hematoma and either confuse its lateralization or obliterate its clinical picture. For these reasons only operative diagnosis is decisive.

As for the author's surgical technique, bilateral trephination is always done. When an extradural hematoma is encountered, the clot is evacuated as quickly as possible through the burr hole. However, if bleeding continues, an osteoplastic flap is elevated and the bleeding is controlled under direct vision. A suture ligature is used on the stem of the middle meningeal artery. In closure the dura mater is drawn up by sutures through the periosteum.

—*Arthur S. Biddle, M.D.*

Brain Tumors: Practical Approach and Classification. Winchell McK. Craig, Henry W. Dodge, Jr., and Hendrik J. Svien. *Minnesota M.*, 1957, 40: 471.

In approaching an analysis and evaluation of malignant lesions of the brain, the authors feel very strongly that a correlation can be made with malignant lesions elsewhere in the body. A fairly accurate assay of 5 year survivals, which has become an accepted rule of thumb covering malignant lesions in other portions of the body than the brain, has been provided. The authors attempt to evaluate malignant lesions of the brain in the same manner, and grade them according to cellular differentiation.

Pathologically, brain tumors can be conveniently subdivided as follows: (1) tumors of the envelopes of the brain (meningiomas, sarcomas); (2) tumors of special structures (pituitary adenomas, pinealomas); (3) tumors arising from heterotopic rests (epidermoids,

dermoids, craniopharyngiomas, chordomas), (4) tumors arising from cranial nerves (neurofibromas); (5) tumors arising from vascular tissue (hemangioendotheliomas); (6) tumors arising from neural elements (gliomas); and (7) metastatic malignant lesions.

However, with the present classification of the glioma group, which constitutes 41 per cent of the brain tumors, the neurosurgeon is confronted with many subdivisions, and obtains only a relative index of their malignant character. A simplification of the present classification of the gliomas together with the grading of the degree of malignancy within each group should be highly advantageous to the neurosurgeon. The glioma group was restudied with this thought in mind. The concept has been applied which is rather universally held by general pathologists in dealing with carcinoma elsewhere in the body; namely, that malignant change represents an anaplastic transformation of adult cells. The neural tissue of the brain is made up of four different types of cells, and when the concept of anaplastic change is applied to the study of gliomas there are five types arising from these cells: namely, (1) astrocytoma, (2) ependymoma, (3) oligodendroglioma, (4) medulloblastoma, and, finally, (5) a debatable neoplasm—neuroastrocytoma.

When considered histologically from the anaplastic concept, the astroblastoma and glioblastoma multiforme are merely more malignant forms of astrocytoma. Likewise, the ependymoblastoma has been shown to be merely a more malignant form of ependymoma. It was determined histologically that the malignant character of each of these five groups could be conveniently graded from 1 to 4. Correlation studies between the grade of tumor and the postoperative survival period substantiate these conclusions.

When one thinks of brain tumors, one must differentiate between the benign and the malignant, and, secondarily, one must consider malignant lesions of the brain in the same manner that one considers malignant lesions elsewhere in the body and treat them in a like manner. Thus, when a diagnosis of glioma of the brain is made it does not necessarily mean that the patient's death warrant has been signed any more than when a diagnosis of cancer of the breast or cancer of the lung is made. Since the gliomas have been studied microscopically and graded in the same manner as cancer elsewhere in the body, the surgeon at the operating table has been able to tell whether or not to approach the tumor radically, remove the section of the brain which contains the tumor, or, in a palliative manner, remove the tumor in situ.

During the recent war, the authors found that pathologists who were acquainted with this system of grading tumors and who were not well versed in neuropathology gave an adequate pathologic evaluation of brain tumor. Regardless of the neuropathologic nomenclature, the observation and grading of gliomas of the brain were helpful in arriving at a diagnosis and, especially, in making a prognosis. This approach to the grading of gliomas has been accepted by pathologists and neurosurgeons in a surprising number of medical centers.

Use of Hypothermia in Nonvascular Intracranial Tumors. J. McNaught Inglis and Eric Turner. *Brit. M. J.*, 1957, 1: 1335.

The authors, after reviewing the current literature concerning the use of hypothermia and intracranial procedures for vascular tumors and aneurysms, point out the possibility of using hypothermia for difficult intracranial operations on nonvascular tumors. They are particularly interested in pointing out the value of hypothermia when the procedures involve the hypothalamus, diencephalon, or brain stem.

Two cases are reported, one of a child of 5 years and 1 of a boy of 15, both of whom had large craniopharyngiomas. This tumor is, as the authors point out, rarely completely removable and the postoperative course is often marked by coma and hyperpyrexia. Both of these patients were operated on under hypothermia with total removal of the craniopharyngiomas and surprisingly smooth postoperative courses. The authors conclude that these cases illustrate the smooth postoperative course which may be expected in operations carried out under hypothermia.

—*Joseph Ransohoff, M.D.*

SYMPATHETIC NERVES

Endoscopic Surgery of the Thoracic Autonomic Nervous System. Herbert A. Roedling, Collin S. MacCarty, and Grace M. Roth. *Surg. Clin. N. America*, 1957, 37: 1403.

Following the lead of Hughes in England, the authors report on the technical aspects of endoscopic surgery on the autonomic nervous system and review the anatomy of the thoracic sympathetic nerves, including the splanchnic nerves, the vagus nerves, and those of the thoracic duct.

To make thoracic endoscopy or, as the authors call it, "thoracoscopy" possible, it is necessary to collapse the lung on the side of operation. Endoscopy should be performed immediately after the induction of the pneumothorax and roentgenologic examination should always be done after the pneumothorax to insure that the lung is uniformly collapsed.

The authors illustrate the thoracic endoscopic units which are employed in their procedure and which were obtained in Germany. These include a lamp holder, a needle for injection of solutions, cautery tips, and optical systems.

They emphasize the role of experimentation on animals in obtaining adeptness in performing such thoracoscopy and have themselves carried out no thoracoscopic procedures in man, but explain the technical steps on the basis of their experience with animals. They review the published reports, however, and summarize what the procedure in man might be. The upper part of the thoracic sympathetic chain is approached by inserting the trocar in the anterior axillary line at the level of the third intercostal space, with the patient in a supine position.

The lower thoracic sympathetic chain and the splanchnic branches can be observed from the midaxillary line in the fourth to seventh intercostal space. Thoracentesis is first performed and the trocar is then slowly advanced until the pleura is entered; finally, the cannula is cleaned with a sponge so that

neither the optical system nor the lamp will be obstructed by blood or bits of tissue. A wide-angle optical system is used to survey the thoracic cavity and, after the proper anatomical structures are visualized, the optical system is exchanged for a regular lens which magnifies. The further technical aspects with respect to control of bleeding and the avoidance of injury to the thoracic duct are discussed and the original article should be consulted for this information.

Whereas the authors do not have personal experience in the management of patients, they suggest that these endoscopic methods may offer therapy to patients who otherwise are not so treated because of the major operative trauma inherent in orthodox approaches. The procedures which they describe may be of short duration and may be performed under local anesthesia. —*W. Eugene Stern, M.D.*

MISCELLANEOUS

The Treatment of Paraplegics (Behandlung von Querschnittsgelaehmten). W. EHALT and A. TITZE. *Chirurg*, 1957, 28: 269.

IN THE TRAUMATIC HOSPITAL of Graz, Austria, there have been 122 paraplegics out of a total of 240,000 admissions since 1940. This hospital receives patients with injuries of the spinal cord from all over Austria. They are given treatment at the hospital until the original skeletal injury is healed and then transferred to the sanitarium of Tobelbad about 8 miles away; here they are instructed how to take care, more or less, of themselves and, if they seem able to return to an occupation, they are retrained in their original skill or are taught a new one.

In the treatment given at the hospital the authors reject the "prone position" treatment as recommended by Watson-Jones. They accept the precepts of Boehler with reference to the correction of the spinal deformity by traction; however, they find that this correction is difficult to maintain. In this connection the plaster splints and corsets advocated by other workers are rejected as too prone to produce pressure ulcers and to interfere with the patient's proper care and general health; these appliances have not been used by the authors for the past 14 years.

The most important progress on the authors' service has been the development of the invertible table. With this apparatus the reclining patient can be turned from the supine to the prone position safely and without effort on the part of the nurse, all without corset or splint. On this table the posture of the patient in the desired degree of lordosis is maintained without discomfort and he has free use of his hands. By this means the attempt has been made to maintain the corrected position of the spinal column, whenever possible without the use of corset or splint.

Finally, in an effort to avoid the use of plaster dressings in the maintenance of the corrected position of the spinal column, the authors have resorted in 9 instances to the internal splinting of the spinal column in the lumbar region by means of bone splints from the bone bank. The method used was that described by Bosworth in 1942, "Clothespin or Inclusion Graft for Spondylolisthesis or Laminal Defects of the Lumbar Spine," and in 2 instances with cervical vertebral fracture wire encirclement of the neighboring spinous processes was done.

The authors were ironically questioned at a medical meeting as to the benefits to be anticipated from rigidly bridging over a lacerated spinal cord. They answered that this is beside the point; and that with this method of internal bracing they merely planned an internal stabilization of the corrected deformity without the use of corsets or splints. This purpose has been attained. The authors have used this method of fixation even in instances of complete transverse paralysis of the spine. —*John W. Brennan, M.D.*

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Thermography; a New Tool in the Investigation of Breast Lesions. RAY LAWSON. *Canad. Services M. J.*, 1957, 13: 517.

COMPLETE SURGICAL EXCISION of a breast cancer is curative, but this desirable result is obtained in probably only 5 per cent of all operative cases. When the average woman reports finding a lump in her breast, axillary metastases are already present in 65 per cent of the cases. Even without axillary spread, 15 per cent of the patients have involvement of the internal mammary nodes. Delay in making the diagnosis has been repeatedly stressed as a major factor in poor operative results. When a tumor becomes palpable, it is usually at least 1 cm. in diameter, and about 40 per cent of such cancers have already metastasized. Consequently, the author is primarily interested in new methods of establishing an earlier diagnosis.

Skin temperatures were found to be elevated 2 to 3 degrees F. over metastatic breast masses. The areolar temperature of a breast containing a tumor was also higher than that of the normal breast on the other side. These temperature changes were comparable to those observed in acute mammary infections. In 2 patients with advanced breast metastases it was found that the intramuscular injection of 1 ml. of heptaldehyde caused pain in visible metastases, which suggested some vascular disturbance within the tumor nodules. Following the heptaldehyde, prompt reduction in the temperature occurred over the areola and the mass if the tumor was malignant. Heptaldehyde had no thermal influence on benign or inflammatory lesions. Decreased temperatures were also noted over cystic lesions. The author therefore thought that "thermography" or heat imaging, might become a useful diagnostic tool, since one of the biological effects of a rapidly growing neoplasm is increased heat production.

He proceeds to discuss the physics of heat imaging, the types of equipment considered (some only recently declassified by military workers), and the several theoretical means of applying thermography to diagnostic purposes. He has used at least two types of equipment and suggests that further improvements may be expected. Photographs are included which demonstrate the method. His series is reported as small; no detailed data are given. Although the author has only recently begun this work, he believes the presently available equipment may be used in the office for the diagnosis of early breast lesions.

—*Emile L. Meine, Jr.*

The Present Status of Hormone Therapy in Advanced Breast Cancer. B. J. KENNEDY. *Radiology*, 1957, 69: 330.

THE AUTHOR surveys the present methods of hormonal control of breast cancer. The various methods are discussed under appropriate headings, and case reports illustrate the efficacy of certain techniques or combination of techniques.

The knowledge of the responsiveness of certain tumors to hormones has stimulated the use of various preparations. At this time an appraisal reveals some order in timing, dosage, and species of drug, or in the operative technique to be used. The response of the organism depends on its endocrinologic status. This accounts for apparent paradoxes in hormonal treatment of advanced breast cancer.

The benefits of castration are mostly limited to the premenopausal patient. This procedure may result in relief of pain, regression of soft tissue lesions, and calcification of bony metastases. Palliation can be achieved in from 20 to 50 per cent in the premenopausal group. Surgical removal is preferred to irradiation. Although the latter, in adequate dosage, can effect castration, the long term results may be unpredictable. Radiation of the gonads is indicated in poor risk patients, and in these, concomitant androgen treatment enhances the effect of radiation. Unpleasant menopausal symptoms are treated by sedation–hormone replacement therapy; even androgens are contraindicated. On the basis of present data it would appear that prophylactic castration is indicated in the premenopausal patient. The period between treatment and the development of metastases seems to be prolonged in this group when compared to the noncastrated group. The patient presented for illustration received marked relief from the pain from osseous metastases following bilateral oophorectomy.

It has been noted that the adrenal glands of patients previously castrated may be enlarged. This suggested that these organs may be producing hormones stimulating the growth of cancer cells. Following bilateral adrenalectomy the rate of regression of tumor growth is similar to that following ovariectomy. The patient who fails to respond to removal of the ovaries will usually not respond to adrenalectomy. Aside from the magnitude of the surgical operation of bilateral adrenalectomy, these patients are difficult to regulate postoperatively. Accessory adrenal tissue may be present.

Administration of growth hormone apparently accelerates the growth of tumors. Hypophysectomy is therefore suggested as a form of treatment of hormone dependent tumors. The postmenopausal woman who responds to estrogen or androgen therapy is a candidate for hypophysectomy, according to the authors. They prefer this to adrenalectomy because the patients are easier to regulate postoperatively. Patients who have responded favorably to therapeutic castration will usually respond favorably to hypophysectomy. A case report is given of a postmenopausal female with cancer of the breast, axillary, and osseus metastases. Fifteen milligrams of stilbestrol caused a disappearance of osseus lesions and axillary nodes, and a decrease in size of the primary tumor. The patient subsequently developed abdominal metastases and became very ill. Cortisone and testosterone acetate were administered with marked improvement. Subsequent to this, hypophysectomy was

done, and regression of the palpable abdominal metastases was noted.

The major effect of androgens is produced on osseus metastases. This form of therapy has very little effect on soft tissue masses. In the postmenopausal female the effects of androgens and estrogens are about the same. Androgens may cause disturbing side effects, and occasionally they may stimulate tumor growth as indicated by the development of hypercalcemia.

In the premenopausal woman estrogens stimulate cancer growth. Tumors which thus respond are known as "estrogen dependent." Massive doses of estrogens in the premenopausal woman may cause suppression of tumor growth, presumably by depressing the pituitary gland. Tumor growth is suppressed in the postmenopausal woman by the administration of estrogens. It may be that smaller doses of estrogen can suppress the pituitary gland at this time, and thus account for the paradox of estrogen administration.

Estrogens have been used as a prelude to radiation therapy of breast cancer. The effect is one of decreasing the size of the tumor to be irradiated. It is suggested that when both forms of therapy are contemplated that estrogens precede radiation, because estrogens following radiation are of little value. The results of estrogen therapy on the tissues are similar to those of radiation, and therein lies a caution regarding subsequent radiation.

The action of adrenal corticoids is rather nonspecific. It would seem that patients who show improvement with this form of therapy obtain even better results from hypophysectomy or adrenalectomy. For the most part, adrenal corticoids are reserved for those with far advanced disease.

—*R. L. Lawton, M.D.*

Osteomyelitis of the Ribs. Sir Russell Brock. *Guy's Hosp. Rep.*, Lond., 1957, 106: 156.

The author treated 17 cases of osteomyelitis of the ribs in a 10 year period (1936–1946) and has seen 3 cases in consultation since then. He found it convenient to divide the cases into those with involvement of the anterior part of the rib (10 cases) and those with involvement of the posterior part (5 cases). The anterior part of the rib is usually affected in children; the onset is acute and simulates pneumonia or pleurisy. The characteristic evolution is toward a superficial abscess which, when the upper ribs are affected, may present as being retropectoral or retromammary. A deeper extrapleural abscess is usually present as well and may be mistaken for an intrapleural empyema. Chronicity follows and a diagnosis of chronic empyema is usually made unless or until the rib affection (usually with sequestrum formation) is recognized.

The posterior part of the rib is so deeply situated beneath the large flat muscles that the clinical course is longer and more obscure. Although there may be early superficial tenderness and swelling, the inflammatory process usually presents deeply, either into the pleura or into the lung. Sequestration occurs into the lung and a chronic lung abscess results with a contained sequestrum. In addition to cough and sputum, severe and recurrent hemoptyses occur. In contrast to infection of the anterior part of the rib, the posterior infection is usually seen in adults. Less common, but also important to recognize, is rib osteomyelitis complicating thoracotomy (usually for infective processes); 2 cases are reported. Persistent discharge, rib pain and tenderness, and general malaise should always suggest the diagnosis of rib osteomyelitis.

—*Earl O. Latimer, M.D.*

Roof Thoracoplasty by the Method of Holst; Results of 100 Consecutive Cases. Thomas Castberg. *Acta chir. scand.*, 1957, 112: 474.

In 1952 Holst described a new technique of thoracoplasty. Similar techniques have later been described by others. A common feature in these operations is that by resection of small segments of ribs a firm horizontal "roof" is formed; this roof consists of the ribs with the intercostal musculature, vessels, and nerves, and can be fixed at various heights. By this procedure the lung is compressed in an appropriate degree. The strength of the roof prevents paradoxical respiration. Upper lobe thoracoplasty may thus be performed in one session. No visible deformity results and no impairment of the function of the arm occurs. The collapse is selective, as it mainly occurs posteriorly, and because of the horizontal roof supplementary resection, if any, will be easier to perform than after standard thoracoplasty.

One hundred consecutive operations on 97 patients had been performed by this technique (3 patients had undergone bilateral thoracoplasty) in the Öresundshospitalet, Copenhagen, Denmark. The two sexes were equally represented, the series contained many relatively old patients, and the majority of the patients had been ill for long periods. The preoperative extent of the tuberculous lesions was classified according to the method of Cold as follows: group 1, unilateral or mild bilateral disease (55 patients), group 2, moderately severe bilateral disease (18), group 3, severe bilateral disease (11), and group 4, bilateral cavitary disease (13). In the present series, 37 patients were classified as good chronics. All of the patients had received preoperative chemotherapy, in the majority of cases for months; often they had had several courses and in massive dosage. The agents used were streptomycin, para-aminosalicylic acid, and, from about July, 1952, isoniazide. In addition, all of the patients were examined with the bronchoscope, but no signs of active bronchial tuberculosis or bronchial stenosis were noted.

In 32 per cent the operation failed; 15 per cent were later subjected to resection and 17 per cent revealed the presence of tubercle bacilli after the operation.

Postoperative hemothorax or pneumothorax of varying severity developed in 18 cases, including 2 which were so severe that drainage had to be employed. Chylothorax developed in 3 cases. One of the patients was subjected to renewed operation, in which the thoracic duct was ligated. The second was later subjected to pleuropneumonectomy and is now well. In the third case, the lesion was detected at the operation, the thoracic duct was ligated, and the patient made an uneventful recovery. Infection in the subscapular cavity occurred in one case which was sub-

sequently treated with revision thoracoplasty. The disease progressed and terminated fatally in this patient. An elevated diaphragm was observed postoperatively in 5 cases, including 2 in which it was associated with postoperative atelectasis. At follow-up examination, the diaphragm was in the normal position in all 5 patients.

Elevation of the diaphragm was observed in a patient, who was otherwise well, 2 years after the operation. The diaphragm had been in its normal position both at and during the first few weeks after the operation. Re-expansion of the compressed lung anteriorly due to defective fixation of the roof occurred in 18 cases, which seems common in most cases with tuberculous lesions localized posteriorly. Among the 18 patients with re-expansion of the lung, a residual cavity was revealed in 7, or 39 per cent. Tubercle bacilli were recovered in 7 of these 18 patients. Residual cavities below a roof in place were found in 11 of 78 cases (14 per cent); 9 of these were positive for bacilli (12 per cent).

Used on wide indications, the Holst thoracoplasty has resulted in a total mortality of 2 per cent, and in about 70 per cent of cures giving a selective permanent collapse as desired. The author concludes that this procedure must be considered a good form of collapse therapy, but gradually as the frequency of complications and the mortality rate in resection decrease, the range of indications for the Holst thoracoplasty should be limited to cases which are considered unsuitable for resection. In view of the danger of re-expansion, the Holst thoracoplasty should not be performed in patients with a thin mediastinal pleura. —*Earl O. Latimer, M.D.*

TRACHEA, LUNGS, AND PLEURA

General Orotracheal Anesthesia for Bronchoscopy. J. S. Reitman. *J. Am. M. Ass.*, 1957, 165: 943.

General orotracheal anesthesia for bronchoscopy is described by the author. The technique has provided comfort and safety for the patient, ease and facility to the operator, and constant control of the patient by the anesthesiologist. The new technique as applied to the average adult includes premedication, about an hour before the induction, by the intramuscular injection of 100 mgm. of demerol, 0.6 mgm. of scopolamine, and 50 mgm. of benadryl. Induction consists of the intravenous injection of 150 to 200 mgm. of thiamylal followed rapidly by 40 mgm. of succinylcholine; then the orotracheal tube is inserted and used for the administration of a 2 to 1 mixture of nitrous oxide and oxygen.

The technique of the bronchoscopy is described as follows. As soon as the orotracheal tube is fixed in position, the operator passes his bronchoscope over the tongue until the uvula comes into view. At this time he can usually locate the orotracheal tube as it appears from the right side of his field of vision. The instrument is manipulated so as to follow the tube as a guide and pass either alongside of or behind it into the larynx and trachea. As soon as the carina is visualized the necessary examinations are meticulously and dexterously performed. The total time spent in the operating room averages 7 minutes for the usual adult who has been subjected to a routine inspection bronchoscopy.

Patients in the older age group from 65 to 70 years of age, are premedicated with 75 mgm. of demerol, 0.4 mgm. of atropine, and 35 mgm. of benadryl. As one goes up into the 70 and 75 year age group, this dosage is further reduced to 50 mgm. of demerol, 0.3 mgm. of atropine, and 25 mgm. of benadryl. For patients more than 75 years of age the author has used 20 mgm. of codeine, 0.2 mgm. of atropine, and 25 mgm. of benadryl.

On the pediatric end of the scale it is imperative to tailor the premedication, the anesthesia, and the size of the tube to the age and physical status of the individual patient. Patients from 14 to 10 years of age were premedicated with 75 mgm. of demerol, 0.4 mgm. of scopolamine, and 35 mgm. of benadryl. The usual adult dose of thiamylal and succinylcholine is given to this group of children, but the size of the tube used may be dropped from No. 4 to a No. 3 (Magill). In the patients under 6 years of age the ventilation problem becomes acute, because of the increasingly diminishing cross sectional area of the glottic and subglottic spaces. A 6 mm. by 35 cm., or even a 4 mm. by 30 cm., bronchoscope leaves very little unoccupied space for the orotracheal tube. In the management of these children the author routinely insufflates oxygen through the sidearm of the bronchoscope, even with the orotracheal tube in place.

Ordinarily the author neither premedicates nor anesthetizes patients under 2 years of age with any of the fixed agents. He controls them with repeated small doses of succinylcholine to average about .25 to 0.33 mgm. per pound of body weight.

The author is now adapting this routine bronchoscopy anesthesia to many surgical procedures which are of short duration but which require excellent relaxation. He has had experience with approximately 200 bronchoscopies in two series.

—*John E. Karabin, M.D.*

Morphological Changes in Smokers' Lungs. John D. Hamilton, Ants Sepp, T. C. Brown, and F. W. MacDonald. *Canad. M. Ass. J.*, 1957, 77: 177.

In recent years statistical evidence has been accumulating that there may be a direct relationship between smoking and the development of bronchogenic carcinoma. Despite the emphasis on the importance of smoking given by the statistical investigations, there have been remarkably few attempts to determine whether or not there is any histologic evidence to implicate smoke as an irritant, and possibly a carcinogen, in man. Experimental work would suggest that tobacco smoke may act as a carcinogen in susceptible animals.

The purpose of the present investigation was to determine whether or not any changes in the bronchial epithelium could be related to smoking.

Selected autopsy cases were studied from the autopsy service of the Toronto General Hospital, and the remainder from the Toronto Western and Sunnybrook Hospitals. No new morphologic alterations were encountered in this study, but there was suggestive histologic evidence that smoking may be a factor in inducing hyperplasia of bronchial epithelium. The

relationship of this to the development of carcinoma cannot be elucidated. —*Harold L. Method, M.D.*

The Surgical Treatment of Chronic Progressive Pulmonary Histoplasmosis. JOHN W. POLK, J. A. CUBILES, and W. W. BUCKINGHAM. *J. Thorac. Surg.*, 1957, 34: 344.

HISTOPLASMOSIS derives its name from the small intracellular bodies found in certain cases of splenomegaly by Darling in 1906, which he termed "Histoplasma capsulatum." These organisms were proved to be a fungus in 1934. Only in the past decade has the widespread nature and frequency of this disease been appreciated. It may be an acute, chronic, latent, or recurrent process, and all organs of the body may be involved. The disease ranges from asymptomatic to severe generalized fatal types. The authors are interested in chronic progressive pulmonary histoplasmosis, which is considered to be reinfection histoplasmosis closely resembling reinfection tuberculosis. This pulmonary form of histoplasmosis is presently treated as pulmonary tuberculosis was treated before specific therapy was available.

The authors have accumulated a series of 21 cases. Three patients had pulmonary tuberculosis as well as pulmonary histoplasmosis. Their ages ranged from 14 to 62 years. Six women and one negro were included in this largely white male group. The duration of illness prior to surgical treatment ranged from 1 to 74 months. The lesions were confined to the upper lung fields in 13 cases, and were bilateral in 4 instances. Fibrocavitary disease was found in 12 patients. Bronchiectasis, cystic disease, middle lobe syndrome, and a destroyed lung were present in other cases. Only one case showed a typical coin lesion, although 2 patients had larger solid lesions. Cough and hemoptysis were the most frequent initial complaints. Seven cases were previously published. The more recent 14 case reports are included in this article. In all, 17 patients have returned to normal life, and another has survived a myocardial infarction. Three patients have died, one after pleuropneumonectomy.

Pulmonary histoplasmosis as a reinfection, or relapsing disease, is demonstrated in these case reports. The authors believe that pulmonary resection is currently the most effective form of treatment. They generally favor lobectomy, although several cases responded excellently to segmental resection; however, each case must be individualized. Pulmonary tuberculosis and histoplasmosis may coexist, and antituberculous drug therapy prior to resection is recommended. The diagnostic benefits of serologic studies for histoplasmosis are uncertain. The histoplasmin skin test was a more reliable aid. Pulmonary histoplasmosis should be suspected in the cases in which all efforts to diagnose tuberculosis have failed, and in such cases of tuberculosis which give a positive histoplasmin skin test and an unsatisfactory clinical response to antituberculous therapy. —*Emile L. Meine, Jr.*

Adrenocortical Hormone Treatment of Pulmonary Tuberculosis. R. MUNRO FORD. *Med. J. Australia*, 1957, 2: 109.

TUBERCULOSIS may be adversely affected by large doses of cortisone because the inflammatory reaction is suppressed and the cellular response to infection is reduced. However, in patients with tuberculous meningitis, the administration of cortisone has enhanced the efficacy of specific chemotherapy. This is caused by the reduction in exudation, nonblockage of the spinal fluid flow, obviation of the neurological complications by the improved vascular reaction and the sustained activity of the adrenal cortex.

In the present study 8 patients in critical condition with far advanced tuberculosis were treated with cortisone and predniselone in addition to specific chemotherapy. The latter consisted of 2 gm. of streptomycin, 900 mgm. of INH and 12 gm. of para-aminosalicylic acid daily. This specific therapy had been instituted several months earlier and cortisone was added when the patients were in extremis. In the latter cases the therapy proved to be a dramatic life-saving measure. Cough, sputum, fever, and red cell sedimentation were significantly reduced, and appetite and weight gain were noted. After 6 months of combined therapy 2 patients showed almost complete recovery with roentgenographic clearing of the lungs and the sputa free from tubercle bacilli. Of the other 6 patients, one died, and in the 5 others toxicity, cough, and infective sputum recurred with cessation of the steroid therapy. It was found that specific chemotherapy in 2 patients was ineffective without the addition of cortisone or predniselone. In the 3 others there was progressive deterioration of the patient.

Group 2 was made up of 4 patients under 40 years of age with chronic pulmonary tuberculosis, positive sputa, and proved resistance to specific chemotherapy of the type outlined. Treatment for 3 weeks with cortisone alone caused marked improvement in cough, temperature, sputum, and weight. When this treatment was discontinued, relapse of the patients was rapid. After 6 months of combined therapy the patients were basically not benefited and corticosteroids were necessary to restrict the severity of the cough and limit deterioration of the condition.

Adrenocortical hormone therapy may be indicated as a heroic measure in patients dying of advanced tuberculosis. In chronic self-limiting tuberculosis steroid therapy is not indicated until a wide range of effective antituberculosis drugs becomes available. The prolonged use of corticosteroids may cause atrophy of the adrenal gland and completely reduce body resistance to any and all infection.

—*B. G. P. Shafiroff, M.D.*

Massive Pulmonary Hemorrhage from Bronchiectasis. B. A. JACKSON and R. B. LYNN. *Canad. J. Surg.*, 1957, 1: 42.

HEMOPTYSIS is common in bronchiectasis. In "dry" bronchiectasis hemoptysis may be nearly the only symptom. Massive hemorrhage may be the sole presenting symptom. Six cases of massive hemorrhage from bronchiectasis are presented, some without preceding respiratory history and some without any preceding episodes of hemoptysis.

Hemoptysis occurs in about one-half of all patients with bronchiectasis; this is presumed to come from the gradual progression of bronchial disease with concomitant enlargement of the bronchial circulation and its enlarged anastomoses with the pulmonary system.

The disease need not be markedly advanced to result in severe hemorrhage. The bleeding point is rarely found even on careful pathological examination of a resected specimen.

When the patient is seen in a quiescent period, bronchoscopy and bronchography are indicated with elective resection of the localized disease. Fatal hemorrhage is not common. Therefore the authors recommend conservative treatment of the patient who presents with massive pulmonary hemorrhage, followed by bronchography when the process has become quiescent. In the presence of continued or massive bleeding emergency bronchoscopy is indicated to localize the region of involvement. Conservative treatment may then be carried out if the patient responds, with later elective resection. If bleeding fails to stop, the offending region of the lung has been identified and emergency resection should be carried out. A bronchial blocker such as Carlen's catheter is helpful.

—*Hermes C. Grillo, M.D.*

Office Treatment of Spontaneous Pneumothorax. Howard Edwards, Jr. *Mississippi Valley M. J.*, 1957, 79: 210.

Treatment following spontaneous pneumothorax is varied, but regardless of the type of treatment, hospitalization is considered mandatory. According to the literature, when rest alone was the treatment, re-expansion of the lung occurred within 3 to 31 days. When aspiration was done re-expansion took place within 6 to 39 days, and when thoracotomy was performed re-expansion was complete in 9 days.

The present report is based on 3 patients who were not hospitalized but were treated at the office. Re-expansion occurred in 25, 38, and 6 days, respectively. Specific treatment consisted of positive pressure oxygen therapy by means of a M.S.A. pulmonary ventilator set to deliver oxygen at 20 to 25 cm. pressure. Treatments were given daily at the office until the roentgenograms showed re-expansion of the lung.

—*B. G. P. Shafiroff, M.D.*

Pulmonary Tuberculosis and Primary Cancer of the Bronchi (Tuberculose pulmonaire et cancer primitif des bronches). C. Scarinci. *Presse méd.*, 1957, 65: 963.

The author re-emphasizes the fact that the coexistence of tuberculosis and bronchogenic carcinoma is not rare; either condition may predate the other and in certain cases it appears that the one is the result of the other. To illustrate this, the author reports 3 cases.

The first of these, in a man aged 50, developed extensive exudative tuberculosis in the left upper lobe. Sputum was positive for tubercle bacilli, and responded to antibiotics and artificial pneumothorax. No bronchoscopy was reported at this time, but 3 months later when the initial benefit of treatment seemed to be lessening, and weakness, fatigue, cough, and dyspnea had recurred, the patient was found to have epidermoid carcinoma of the left upper lobe, which was proved bronchoscopically.

The second patient, a man of 46, with primary carcinoma of the lung, eventually had an intermittently positive (for tubercle bacilli) sputum which was presumably the result of erosion of an old tubereulous focus by invasive carcinoma.

A third male patient, aged 46, developed carcinoma of the right lung 3 years after thoracoplasty on the right side. Autopsy eventually showed that the tumor was quite independent of the tuberculous process.

The author concludes, without attempting to support the conclusion by statistical evidence, that the coexistence of pulmonary tuberculosis and bronchogenic carcinoma is, in most cases, fortuitous.

—*J. Gordon Scannell, M.D.*

Bronchial Adenomas; Problems in Diagnosis and Treatment, with Particular Reference to Roentgenologic Aspects. Seymour Ochsner and Alton Ochsner. *South. M. J.*, 1957, 50: 1089.

The authors report a study of 16 cases of adenoma of the bronchus seen at the Ochsner Clinic and Ochsner Foundation Hospital during the 12 year period ending July 1, 1956. During that same 12 year period there were 1,360 cases of bronchogenic carcinoma and an incidence of bronchial adenoma of 1.2 per cent. The authors studied their cases by means of the usual clinical picture, essential pathologic concepts, and diagnostic methods, and considered the problems of treatment.

The clinical features are dependent on the mechanical effects of an endobronchial tumor. As the small endobronchial tumor grows, the first symptom is likely to be cough. Following this the thoracic discomfort, hemoptysis, and recurring fever appear. The clinical signs are localized rales, decreased aeration, wheezes, or dullness in the affected area. The authors note that, in comparison to bronchogenic carcinoma, the bronchial adenoma occurs in the earlier age group. The history of cough, hemoptysis, and pneumonia is more apt to be recurrent whereas in bronchogenic carcinoma it is more likely to be unremitting. The resectability rate is about 80 to 90 per cent. The 5 year survival is about 75 per cent.

The pathology in the authors' 16 cases was carcinoid adenoma in 16 cases and remained unclassified in 2 cases. It is thought by many workers in this field that bronchial adenoma should be classified as a low grade carcinoma. Most observers agree that the adenomas are locally invasive and slowly growing, their regional lymph nodes are often involved (in about 20 per cent), and that they may produce more extensive metastases. There were 18 reported cases of hepatic metastases. The gross picture of the tumor is one of origin from the epithelium of the bronchial mucus glands or ducts, and the tumor grows in both intrabronchial and extrabronchial fashion. A strictly endobronchial lesion is rare. The extrabronchial portion is usually much larger. Secondary changes occur in the lung periphery because of obstruction and inflammation. These include the pneumonitis and suppuration of bronchiectasis.

The roentgenologic pattern is the best means of diagnosis. In the authors' cases there were no normal chest roentgenograms. Every case had a discernible lesion. This was either a hilar mass or a hilar mass with atelectasis, pneumonitis, or enlarged nodes, or one peripheral mass. With bronchography and planography endobronchial tumors could be demonstrated. Peripheral nodules occurred only rarely and were seen in 2 cases. The hilar mass arising from the major

bronchi and growing both endobronchially and extrabronchially produced the most common roentgen image. The involved hilum became denser and larger than normal. The authors presented x-ray reproductions to show these various deformities. Obstructive emphysema occurred on occasion as a result of a ball valve action of the tumor with obstruction behind the tumor. Atelectasis supervened on emphysema as the obstruction became more complete and the lung collapsed. On roentgenography the atelectatic lobe was fanlike in appearance with its apex toward the hilum. Pneumonitis may occur from the obstructing bronchial tumors, and it is often difficult to differentiate inflammatory changes from obstructing ones. Finally, bronchiectasis may supervene as continued obstruction, and atelectasis and pneumonitis may recur. This is better demonstrated by bronchography than by plain film. Rarely, the adenomas may grow to such size or secondary changes in the lung may be so extensive that the entire picture may mimic lobar pneumonia.

Bronchoscopy is an important means of study and is strongly advocated by the authors. It is particularly helpful in bronchial adenomas because most of them arise from the larger bronchi and will be visible to the endoscopist. In 12 of 13 cases the authors found positive signs.

With regard to treatment, it is difficult to decide on occasions whether a radical or a conservative surgical procedure should be carried out, but the authors feel strongly that operative intervention is indicated. They believe that both medical management including therapeutic bronchoscopy and radiation therapy are probably of little help. Surgical excision is recommended because the tumor is a relatively slow growing one and lends itself to curative surgery. The authors are inclined to favor pneumonectomy since the tumor basically is probably a low grade malignant one, and pneumonectomy offers the best hope of cure. They feel that lobectomy should be reserved for patients who are not such good risks.

Of 12 patients on whom pneumonectomy was performed 9 are living and well 6.5 years following surgery.

—Peter Dineen, M.D.

Diagnosis of Bronchial Carcinoma (Considerazioni diagnostiche sul carcinoma bronchiale). C. COLOMBO and F. VIGLIONE. *Minerva med.*, Tor., 1957, 48: 2575.

THE AUTHORS discuss the diagnosis of bronchial carcinoma. The differential diagnosis is often difficult and sample cases are described. A review of the differential points with regard to tuberculosis is presented. Closed cysts of parasitic and embryonic origin are also discussed. Particularly difficult problems are found in differentiating carcinoma with associated abscess. Pancoast's syndrome is fully discussed.

The authors stress the importance of thorough systematic investigation. If conclusive results are not obtained, too much time must not be spent with medical management. If the response is not prompt and definite, thoracotomy should be carried out. In many cases thoracotomy is the only means of arriving at a diagnosis. If the lesion is a tuberculoma or a cyst, excision can be considered a therapeutic as well as a diagnostic procedure.

Too much reliance should not be placed on the rate of growth as a diagnostic aid. Many cases may remain stationary for months or occasionally for years and then rapidly grow and metastasize. In some not too rare cases the cancerous mass may diminish in size due to aeration of atelectatic areas and diminution of infection only to start to grow rapidly some time later.

—Lucian J. Fronduti, M.D.

The Incubation Period of Bronchial Carcinoma. EDWARD C. LAWLESS. *J. Internat. Coll. Surgeons*, 1957, 28: 460.

THE AUTHOR presents his series of 178 cases of carcinoma of the lung observed since 1952. Sixty-three per cent of the lesions were squamous cell or bronchogenic carcinomas, 26 per cent adenocarcinomas, and 11 per cent were of the oat cell type. One carcinoid and a myxofibroma were included in the bronchogenic category. No patients who were operated upon in 1952 are still living. The 1956 mortality rate was 69 per cent. In 1956, 52 patients underwent operation for lung cancer, but only 21 were suitable for resection, and in many of these cases this procedure was considered palliative rather than curative at operation. During the 5 year period, the age range of these patients was 28 to 81 years, with an average of 56 years. Male patients comprised 80 per cent of the series. The average postoperative survival declined from 7.9 months in 1952 to 2.7 months in 1956, chiefly because more poor-risk patients were being subjected to palliative procedures.

The main interest in this review was to determine the "incubation period" of carcinoma of the lung or, more precisely, the time element between supposedly "negative" roentgenograms and those showing evidence of lung tumor. Very brief case histories of 21 patients on whom suitable data were available are presented. The average time interval of "incubation" was about 19 months in this group of 21 persons. The time interval for those with adenocarcinoma was 29 months, for those with oat cell carcinoma it was 21 months, and for those with the squamous cell type, 20 months. The approximate average was lowered by incomplete data in a few cases.

There is yet no prophylaxis for cancer, and the treatment of choice for lung tumors is adequate resection with the shortest possible "incubation period". At present, lung cancer appears to be increasing in both relative and actual frequency. Accordingly, the author points out that this presentation argues strongly for every individual to have a chest roentgenogram taken at least once yearly.

—Emile L. Meine, Jr., M.D.

Carcinoma in Situ and Early Invasive Carcinoma Occurring in the Tracheobronchial Trees in Cases of Bronchial Carcinoma. OSCAR AUERBACH, J. BREWSTER GERE, JOSEPH M. PAWLOWSKI, GERALD E. MUEHSAM, HAROLD J. SMOLIN, and ARTHUR PURDY STOUT. *J. Thorac. Surg.*, 1957, 34: 298.

HAVING PREVIOUSLY reported evidence of precancerous changes in cases wherein carcinogenic agents were applied to the tracheobronchial tree, the authors investigated the incidence of carcinoma-in-situ in patients with carcinoma of the lung. They were also

interested in the distribution of carcinoma-in-situ throughout the tracheobronchial trees of these patients, as to whether early invasive carcinoma occurred in other parts of the tracheobronchial tree, and in the clinical importance of these findings. Fifty-four white males were studied, ranging in age from 32 to 84 years. At the time of death from lung cancer, 72 per cent were in the 50 to 69 age group. All had smoked tobacco, although 2 had never smoked cigarettes.

In this histological study, 7,993 slides obtained by serial sectioning were found satisfactory for reporting, and each slide was examined by 3 pathologists. The main lesion in 33 patients was the squamous celled type, with varying degrees of differentiation, some of the lesions having glandular features. There were 16 patients who died of undifferentiated carcinoma, 3 with alveolar cell carcinomas, and 2 with malignant cylindromas. Carcinoma-in-situ was seen in 17 per cent of the slides, or 48 of the 54 cases. These findings were divided into two groups: (1) definite carcinoma in-situ, in which all of the accepted criteria for this diagnosis existed, with an incidence of 9.2 per cent, and (2) borderline carcinoma-in-situ in which one or two criteria were lacking, in 7.8 per cent of cases. These in-situ changes were scattered widely throughout all segments of the tracheobronchial tree. The lung opposite the side of the main tumor was comparably involved with these lesions.

Early invasive carcinoma was found in 5 of the 54 cases, being present on one slide in 2 cases, and on 4, 9, and 20 slides, respectively, in the other 3 cases. The finding of early invasive carcinoma adjacent to carcinoma-in-situ suggests that the latter is a stage prior to actual invasion. The opinion is advanced that the wide dissemination of these lesions may contribute to the low surgical cure rate, since new cancers from multicentric foci as well as metastases of the resected tumor may be involved. The authors can advance no reason for the infrequence of primary carcinoma of the trachea, although carcinoma-in-situ was as prevalent in the trachea as it was in the left main bronchus.

—Emile L. Meine, Jr.

Carcinoma of the Lung; Factors Which Influence 5 Year Survival, with Special Reference to Blood Vessel Invasion. F. C. D. COLLIER, W. S. BLAKEMORE, R. H. KYLE, H. T. ENTERLINE, C. K. KIRBY, and J. JOHNSON. *Ann. Surg.*, 1957, 146: 417.

SIX HUNDRED PATIENTS with carcinoma of the lung were reported on. Forty-two per cent were considered inoperable. The remaining 58 per cent were subjected to exploratory thoracotomy. Of the operable group 65 per cent were subjected to pulmonary resection, while the remainder were deemed inoperable. A conservative type of pneumonectomy was practiced in this series. Of the patients who had pulmonary resection 53 per cent had a positive preoperative diagnosis (based on biopsy or cytologic study of the secretions). There was an operative mortality of 7 per cent. The 5 year survival was 25 per cent for all patients undergoing resection, or 8.7 per cent for those who entered the hospital.

Up until the present time it has seemed that the factors which most uniformly affect the 5 year survival rate have been the size of the tumor, the presence or absence of lymph node invasion, and the type of malignancy found at operation.

Another factor which apparently plays an important part in the 5 year survival rate is that of blood vessel invasion by the tumor as seen by microscopic examination of the surgical specimen. It has been possible to obtain a 100 per cent follow-up on the patients who were subjected to pulmonary resection, and procedures were instituted to study the influence of blood vessel invasion and lymph node extension upon the 5 year survival rate.

The incidence of blood vessel invasion for the entire group was 71 per cent, for undifferentiated carcinomas, 100 per cent, and for epidermoid carcinomas, 63 per cent. The studies show that most of the patients with blood vessel invasion died within 2 years and only 6 per cent survived 5 years, as compared to a 5 year survival of 75 per cent among those without blood vessel invasion. However, the 5 year survival was 17 per cent with lymph node invasion and 39 per cent without lymph node invasion. The presence or absence of lymph node invasion has little or no influence on the prognosis in the presence of blood vessel invasion. The results of this study show that with neither blood vessel invasion nor lymph node invasion the 5 year survival was 83 per cent, and it was still 60 per cent with lymph node invasion provided there was no blood vessel invasion.

Thus, the absence of blood vessel invasion might very well stimulate the surgeon toward the use of "radical pneumonectomy" in the hope of getting the last lymph node which might be involved. On the other hand, the presence of blood vessel invasion can be taken as evidence that distant metastasis has already occurred. *—Arthur M. Simpson, M.D.*

The Significance of Cardiopulmonary Reserve in the Late Results of Pneumonectomy for Carcinoma of the Lung. WILLIAM E. ADAMS, JOHN F. PERKINS, JR., ROBERT W. HARRISON, WALTER BUHLER, and EDWIN T. LONG. *Dis. Chest*, 1957, 32: 280.

SINCE GRAHAM'S SUCCESSFUL TREATMENT of a primary carcinoma of the lung in 1933 with pneumonectomy, this procedure has been generally accepted. However, in a definite percentage of cases there has been operative mortality in the interval from one week to six months after the operation, the etiology of which has often been poorly understood.

Extensive pulmonary resection was performed in 30 dogs so as to leave a single upper lobe, and the pulmonary artery pressure and the oxygen saturation were measured at intervals in these dogs. These experiments demonstrated that there was a rise in the pulmonary vascular tension up to 100 per cent, when the lung capacity was reduced to from 15 to 20 per cent of the normal. They further demonstrated that when the demand for oxygen was increased by activity, the pulmonary hypertension was increased and then the blood oxygen saturation was disturbed.

Two cases of death associated with right heart failure 26 and 20 days after pneumonectomy are presented.

Six dogs in whom the lung capacity had been reduced to approximately 25 per cent of the normal

were studied 6 to 8 years after the operative procedure. It was found that during the interval there had been some compensation with a return toward normal of the intravascular pressure, but even mild exercise could still produce sizable increases in pressure and some of the animals continued to have pulmonary hypertension.

Finally, a group of 30 patients were also studied 8 to 15 years after pneumonectomy, by means of cardiac catheterization to measure the pulmonary intravascular pressure and oxygen saturation. In only 5 of these patients have the full studies been completed, but results are comparable to those in animal studies and fit well with the clinical evaluation of the patient.

The authors conclude that the presence of pulmonary hypertension seriously decreases the ability of the individual to compensate for the loss of pulmonary capacity. The ability to compensate for these changes is also apparently variable. In general, pulmonary reserve is decreased in older individuals and the ability to compensate is gradually also decreased. The authors state that from these studies it seems reasonable to consider partial resection for carcinoma whenever it appears that all tumor tissue may be included in such resection. —*Lockert B. Mason, M.D.*

HEART AND PERICARDIUM

Arrest of Isolated Heart with Potassium Citrate. J. B. E. Baker, H. H. Bentall, B. Dreyer, and D. G. Melrose. *Lancet*, Lond., 1957, 2: 555.

In vitro perfusion studies were carried out on 60 hearts of rabbits and on 4 human fetal hearts to ascertain the relative value of potassium citrate and potassium chloride in arresting the myocardium. The so-called Martin-Langendorff method was employed. In this technique the nutrient solution is delivered at constant pressure through an aortic cannula directed toward the aortic valve. Thus the force of the perfusion fluid closes the valve and the (perfusion) fluid can, then, flow only through the coronaries. Only from the cut ends of the great veins and the pulmonary artery does the fluid escape. With this technique it is customary for perfused hearts to beat regularly with slowly diminishing force for many hours. Ventricular performance is assessed by measuring the amplitude of the beat which is conveniently recorded on a revolving cylinder by a lever attached by thread and hook to the apex of a perfused heart.

A 30 minute baseline level of activity was initially established while perfusing with Locke's solution at 37 degrees C. On merely stopping the coronary perfusion by turning off the perfusion fluid supply and waiting for 15 minutes all 19 hearts resumed contractile activity within 15 minutes and 13 demonstrated an amplitude of contraction equivalent to 98 per cent or more of their baseline amplitude. If coronary perfusion was prevented for a full 30 minutes, then return of myocardial contraction amplitude was impaired. If the heart had been previously arrested by perfusion with potassium, then a greater amplitude of ventricular contraction was demonstrable after resumption of coronary flow. Thus arrest of the beat enhanced the resistance of the myocardium to the deleterious effect of coronary occlusion. During the interval of coronary occlusion (without arrest), even when continued for half an hour, it was interesting that the hearts persisted in beating, although steadily diminishing in force. When the arrest of the beat (by potassium) together with occlusion of the coronary flow was extended to 45 minutes, the recoverability of the myocardium as reflected by the amplitude of ventricular contractions was significantly impaired.

Experiments with sodium citrate failed to arrest the beating heart. Thus the potassium, not the citrate, is the critical ion.

The four fetal hearts were obtained from dead fetuses delivered some 30 minutes or more previously from their mothers. They were 16 to 20 week gestations. In all 4 instances perfusion with Locke's solution caused good cardiac revival. Within 20 minutes the beats were regular. Subsequent potassium-induced arrest together with coronary occlusion for 15 minutes was followed by resumption of good ventricular contractions of an amplitude the same as that prior to arrest and occlusion.

In all instances potassium citrate (1 to 2 mgm. per ml.) arrested all hearts within 10 to 30 minutes. There was complete myocardial flaccidity. When potassium chloride was used there were occasional episodes of fibrillation which could be avoided by reducing the calcium concentration of Locke's solution. There were no escaped beats or fibrillation with potassium citrate. —*Everett Shocket, M.D.*

Experimental Study of Myocardial Compression (Étude experimentale de la compression myocardique). J. Seror, A. Albou, and Cl. Azoulay. *Sem. hôp. Paris, Ann. chir.*, 1957, 11: 525.

The authors present an extensive series of investigations of hemodynamic changes which occur as a result of myocardial compression by increasing intrapericardial pressure. Observations were made on a series of dogs in which a hermetically sealed pericardial fistula was established which permitted manipulation of the intrapericardial pressure by the injection and withdrawal of fluid. The practical application of the results lay in the clinical management of heart wounds.

It was easily demonstrated that under conditions of acute tamponade, the addition of relatively small amounts of fluid to the intact pericardium produced marked elevation of the intrapericardial, and hence the peripheral, venous pressure. There was a reciprocal fall of the arterial pressure to a dangerous degree. The pressure rose at first gradually with steady increments of pericardial fluid, became steep after 90 to 100 c.c., and became intolerable at 120 to 130 c.c. Translated to the clinical problem of acute tamponade, the authors noted that the effects could, in part, be overcome by the vigorous administration of intravenous fluids and the use of peripheral vasoconstrictors. They also noted the surprising fact that the use of peripheral vasodilators (arfonad) had clinical utility by reducing the amount of blood loss (in the event of operation) and by lowering the peripheral venous pressure to allow a greater degree of blood replacement.

In addition to the hemodynamic effects noted, there was a rise of the cerebrospinal fluid pressure

with acute tamponade which may have accounted in part for the symptoms which these patients had. There was also a reflex bradycardia after an initial tachycardia. In part this may have been the result of lowering the coronary perfusion pressure so that the myocardium was unable to respond to changes in load. The electrocardiographic changes were confined chiefly to T-wave inversion and lowering of the S-T segment, but there may have been some decrease in the amplitude of the P waves.

If the intravascular pressure changes were measured in the various components of the lesser and greater circulatory systems, the following changes, as a result of rises in intrapericardial pressure, were found: (1) a rise in the right atrial pressure, (2) a marked fall in the systolic pressure in the right ventricle, with a slow rise in the diastolic pressure, (3) an increase in the pulmonary artery diastolic pressure and gradual fall in the pulmonary systolic pressure, (4) a significant rise in the pulmonary capillary and, *pari passu*, in the left atrial pressure, and (5) a significant fall in the left ventricular systolic pressure and a gradual rise in the diastolic pressure.

The authors interpret these findings to mean that the primary hemodynamic defects in acute tamponade are twofold. There is obstruction to the circulation at the level of the atrium which markedly causes low pressure and a lesser circulation with consequent embarrassment to that system. Secondly, there is marked reduction of the efficiency of the ventricular filling and, hence, effective output. The first of these effects will, of course, be intensified by positive pressure anesthesia. —*J. Gordon Scannell, M.D.*

Ventricular Septal Defects in the Infant Age Group. STELLA C. ZACHARIOUDAKIS, KORNEL TERPLAN, and EDWARD C. LAMBERT. *Circulation*, 1957, 16: 374.

THE CLINICAL FEATURES and postmortem findings of 23 infants who had a ventricular septal defect and died in heart failure are analyzed by the authors. This defect comprised 23 (8 per cent) of 288 major cardiac malformations observed at autopsy over a 20 year period at a children's hospital. The majority of the deaths occurred during the first 3 months of life.

Hemodynamic data obtained in 6 of these infants revealed a large left-to-right shunt and marked right ventricular and pulmonary artery hypertension in all. In 3 of the patients the shunt appeared at the atrial as well as the ventricular level. In 5 the systolic pressure in the right ventricle was equivalent to the pressure in the systemic artery.

There was a wide variability in the electrocardiographic findings with respect to evidence of ventricular hypertrophy. Patterns of right, left, and combined ventricular hypertrophy were found without apparent correlation with the clinical, hemodynamic, or postmortem findings.

No apparent relationship was found between the size of the defect or its location on the septum and the clinical manifestations or age at death. Four of the hearts had small defects, less than half the diameter of the aortic orifice.

Distinct medial hypertrophy of the small pulmonary arteries was present in 12 cases; in 6 cases, no significant changes were seen.

The surgical implications of these findings are discussed. —*John J. Maloney, M.D.*

Evaluation of Direct Surgical Relief of the Pulmonary Obstruction in Fallot's Malformation. L. R. LAFLÈCHE, G. GILBERT, and E. D. GAGNON. *Canad. M. Ass. J.*, 1957, 77: 559.

ALTHOUGH OPEN CARDIOTOMY for correction of the valvular or infundibular narrowing of the pulmonary artery outflow in patients with Fallot's malformation may be more accurate and direct than "blind" procedures, experience with 26 patients indicates that excellent relief of symptoms may be obtained with the "blind" technique. These patients had tetralogy, pentalogy (added defect of auricular septum), or trilogy (pulmonary stenosis, auricular septal defect, and right ventricular hypertrophy). Potts valvulotomy was used if the stenosis was valvular and the Glover or Nichols rongeur was used to bite away fibrous endocardium if the stenosis was subvalvular.

Excellent relief from cyanosis, clubbing, dyspnea, intolerance to exercise, polycythemia, and right ventricular hypertrophy was obtained in at least two-thirds of the patients. Of 8 operative deaths, at least 6 were thought to be preventable.

The clinical responses were not paralleled by measurable changes in the right ventricular pressures.

—*Leonard D. Rosenman, M.D.*

Pseudoaneurysm of the Left Ventricle; Diagnosis by Direct Cardioangiography. RALPH C. SMITH, HARRY GOLDBERG, and CHARLES P. BAILEY. *Surgery*, 1957, 42: 496.

IN THE PERFORMANCE of various open heart operations the incision frequently is made through the ventricular wall. Although it is usually accepted that ventricular incisions heal readily, the authors report two cases which illustrate complications of inadequate healing. Furthermore, it is suggested that as larger ventricular incisions are made coincidentally with improvements in pump-oxygenators, the incidence of breakdown of ventricular incisions will increase. Pseudoaneurysm of the ventricle is defined as a false aneurysmal sac whose walls are formed by pericardium and whose interior communicates with the ventricular lumen through the site of the cardiotomy incision.

The first patient was a 31 year old woman, who 4 months previously had had a mitral commissurotomy performed at another hospital. During the operation the wall of the left ventricle was inadvertently perforated by the surgeon while applying pressure to the anterolateral valve commissure. However, the laceration was repaired and the patient resuscitated. A bulging shadow subsequently developed along the left cardiac border as shown by roentgenogram. At operation there was a large pseudoaneurysm, which communicated with the lumen of the left ventricle through two separate openings.

The second patient, a 38 year old woman, was noted to have an abnormal bulge on the left border of the cardiac silhouette two years after combined mitral and transventricular aortic commissurotomies. At operation a lemon-sized false aneurysm communicated with the cavity of the ventricle through a single opening 8 millimeters in diameter.

Direct cardioangiography was believed to be of considerable value in the diagnosis of these cases The contrast material, 70 per cent diodrast, is injected through a No. 17 thin-walled needle inserted into the left atrium through the back. Approximately 30 c.c. of diodrast were injected manually over a 2 second period, while twelve exposures were taken over a 6 second period. The authors believe that injection into the left atrium is much safer than direct left ventricular punctures, with which there is greater likelihood of intramyocardial injections or injury to coronary vessels. Greater familiarity with the transthoracic route has led the authors to prefer this over the transbronchial approach.

The technique of surgical repair employed in each case consisted first in digital explorations of the aneurysm through a purse string suture in the wall of the aneurysm. While the opening in the ventricle was tamponaded with the finger tip, the sac was excised and the defect closed with mattress sutures. In the first patient in whom there were two openings, one opening was temporarily closed with a patch of pericardium in the manner of an atrioseptopexy. Each defect in turn was then closed with mattress sutures. Both patients did well after operation.

Careful and adequate closure of all ventricular incisions should be carried out in order to prevent these complications. However, once a pseudoaneurysm has developed it should be treated surgically without delay. —*George R. Holswade, M.D.*

Confusion of Tricuspid Incompetence with Mitral Insufficiency; a Pitfall in the Selection of Patients for Mitral Surgery. Donald P. Schilder and W. Proctor Harvey. *Am. Heart J.*, 1957, 54: 352.

A number of patients have been denied surgery for severe mitral stenosis because prominent mitral insufficiency was believed to coexist. The mitral insufficiency has been diagnosed erroneously in some of these patients on the basis of a moderately loud apical systolic murmur. Actually, it was the murmur of tricuspid incompetence confused with that of mitral insufficiency. These patients are denied surgical relief of incapacitating mitral stenosis when they could be benefited.

Three clinical criteria of true mitral insufficiency are useful and achieve the greatest percentage of correct diagnoses. These are: (1) a large dynamic left ventricle as evidenced by physical examination, the electrocardiogram, or radiologic examination; (2) an unusually large (giant) left atrium; and (3) a loud apical systolic murmur. A grade 3 or more (on the basis of 1 to 6) high-pitched apical systolic murmur usually means significant mitral insufficiency. The murmur characteristically diminshes in intensity on deep inspiration and is usually transmitted best toward the left axilla and posterior lung base. This murmur may be confused with the murmur of tricuspid incompetence. Functional tricuspid incompetence is not uncommon in rheumatic heart disease with mitral stenosis. The murmur of tricuspid incompetence varies considerably. It may be soft, high pitched, musical, or even harsh. It differs from the murmur of mitral incompetence in that it is heard best over the xiphoid area and along the lower left sternal border, and becomes louder on deep inspiration. The murmur of mitral insufficiency becomes fainter on inspiration. The authors found tricuspid insufficiency associated with mitral stenosis no contraindication to mitral commissurotomy even in patients who had far advanced disease and failed to respond to medical therapy. Five patients are presented in detail who illustrate the above points and emphasize that an excellent clinical result may be achieved even though nothing is done to the tricuspid valve. Great improvement was achieved even though the patients exhibited tricuspid insufficiency with a large right atrium, systemic venous and hepatic pulsation, ascites, jaundice, cyanosis, and edema. The response to mitral commissurotomy was uniformly good in these patients. —*Lloyd D. MacLean, M.D.*

The Left Atrial Pressure Pulse in Mitral Valve Disease; a Correlation of Pressures Obtained by Transbronchial Puncture in the Presence of This Valvular Lesion. Andrew G. Morrow, Eugene Braunwald, J. Alex Haller, and Edward H. Sharp. *Circulation*, 1957, 16: 399.

Left atrial pressures were determined by transbronchial puncture in 53 patients with mitral valve disease of proved type. Thirty-nine patients had mitral stenosis and required a commissurotomy; of these, 7 had significant associated regurgitation. Fourteen patients had pure mitral insufficiency.

The left atrial pressure pulses were analyzed by several previously described methods. Of these, the ratio Ry/v (Owen and Wood) proved most useful in distinguishing mitral insufficiency from predominant mitral stenosis.

The ratio Ry/MLAP as well as the fractional analysis of the y descent and of diastasis afforded the best separation of the 2 groups. However, in the presence of predominant mitral stenosis, the severity of the accompanying mitral regurgitation could not be determined with any method of analysis.

None of the left atrial pressure curves of the patients with mitral stenosis exhibited diastasis, and the significance of this observation is emphasized. —*John J. Maloney, M.D.*

The Possibility of Utilizing the Planes of Cleavage at the Base of the Heart (Les possibilités d'utilisation des plans de clivage de la base du coeur). J. Grisoli, E. Henry, J. Gambarelli, R. Courbier, and H. Richelme. *Presse méd.* 1957, 65: 958.

It is possible in dogs to define very clearly three useful planes of cleavage in the areolar tissue at the base of the heart. By making use of these recognized planes, surgical manuevers involving the great vessels at their point of origin are greatly facilitated.

The first of these planes is the interatrial plane, exploited so effectively by Sondergaard, and this plane can be developed almost to the annulus fibrosis. It is particularly useful in approaching the left atrium via the right chest.

The second useful cleavage plane, beneath the transverse sinus of the pericardium, is the line of fusion between the posterior surface of the fused aorta and pulmonary artery and the anterior surface of the atria. This plane is limited inferiorly by a line between

the origins of the coronary arteries, and provides an avenue of approach to the proximal portion of the left coronary artery.

The third useful cleavage plane is the triangular area between the ascending aorta and the main pulmonary artery. This extends upward from the annulus fibrosus of the aorta, into which the cusps of the aortic valve are inserted, to the beginning of the transverse arch of the aorta. Familiarity with this plane should prove useful in the approach to defects involving the first portions of the aorta and pulmonary artery. —*J. Gordon Scannell, M.D.*

Staphylococcal Infections of the Heart and Great Vessels Due to Silk Sutures. HENRY T. BAHNSON, FRANK C. SPENCER, and IVAN L. BENNETT, JR. *Ann. Surg.*, 1957, 146: 399.

THIS REPORT is a review of 5 cases of postoperative infection of the myocardium and great vessels in which silk sutures constituted the site of minimal resistance to infection. In each the definitive therapeutic maneuver was reoperation and removal of the foreign body.

Because abnormalities of the heart and great vessels, particularly valvular deformities, shunts, or other intravascular turbulence, predispose to local infection by way of the blood stream it is not surprising that previous descriptions of postoperative cardiovascular infection have emphasized this factor. Persistence of local bacterial infection in the presence of a foreign body is even more familiar. It is surprising that so little attention has been paid to silk sutures as the cause of persistence of infection after cardiovascular surgery.

In the 5 cases reviewed here, postoperative infection clearly consisted of stitch abscesses around silk sutures in the heart or great vessels. The importance of recognition of this type of infection rests in the extraordinary resistance of the infecting bacteria to antimicrobial drugs while the foreign body remains as a nidus, and the prompt cure that can be obtained when the sutures are removed.

It is not possible to state with certainty the route of infection in all the cases presented. It is entirely possible that the source of organisms was a transient postoperative bacteremia due to staphylococci and that localization occurred because of focal lowering of resistance at the sutured sites, but it seems more likely that infection was introduced directly at operation.

The "lag periods" between operation and onset of the clinical manifestations of infection of 6 weeks and 5.5 months in the cases presented may well represent the suppressive effect of antibiotics given postoperatively. The apparent response to treatment of infection with antibiotics in several of these patients with relapse when the drugs were stopped seems to constitute an important part of the clinical picture of this complication of cardiovascular surgery.

There is general agreement that the incidence of surgical infection is related to the number of individuals in the operating room and agitation of the air. In an effort to find out whether the composition of sutures used is important in producing infection when minimal contamination occurs, the reaction to several materials implanted in the right ventricular myocardium of dogs was studied. In the presence of minimal contamination by staphylococci, silk, stainless steel, nylon, dacron, and catgut sutures led to the formation of infected granulomas from which organisms could be cultured for as long as 6 weeks. Of great interest was the fact that the infections associated with catgut were observed regularly to subside and to heal spontaneously after 3 weeks, presumably because of the gradual absorption of the foreign body. A great deal more evidence will be needed before the use of catgut sutures can be recommended for cardiovascular surgery, however. —*Arthur M. Simpson, M.D.*

ESOPHAGUS AND MEDIASTINUM

Neoplasms of Vascular Origin in the Mediastinum. ANWAR BALBAA and J. T. CHESTERMAN. *Brit. J. Surg.*, 1957, 44: 545.

PRIMARY NEOPLASMS of vascular origin in the mediastinum are rare. This article reviews the cases so far reported in the literature, and reports 3 new cases which present some interesting features. The real incidence of these neoplasms in relation to other mediastinal masses is very difficult to estimate. However, the widening scope of thoracic surgery, together with the increasing use of mass radiological surveys, has led to the discovery and treatment of many such cases. Altogether, 66 cases have been mentioned in the literature. Of these, tumors originating in the pericardium (9 cases) and the cases belonging to the hemangiopericytoma group (3 cases) are discussed separately. Of the remaining 54 cases, only 34 were included in this survey together with the 3 new cases described, these being the cases which have been reported in sufficient detail.

No age seems to be exempt; the youngest patient was a premature infant and the oldest was a 61 year old patient. Only 6 patients were over the age of 40 years, but it is of significance to note that 6 were below 1 year of age. Both sexes seem to be equally affected, 20 of the patients being males and 17 females.

Ten cases were found to be malignant and 25 were benign. The highest incidence of malignancy was in the third and fourth decades where 7 out of 14 cases were malignant.

It has been stated that vascular tumors occur in all parts of the mediastinum with equal frequency. However, in the cases reviewed in the present study, it was found that the anterior mediastinum was much more frequently affected, more noticeably so in benign cases.

It is difficult to establish the correct diagnosis of hemangioma before thoracotomy is performed. There was only 1 case in this series in which the correct preoperative diagnosis was reached, after histologic examination of a needle-aspiration biopsy of a malignant mediastinal tumor that had eroded the ribs posteriorly. In some cases hemangioma is considered the most likely diagnosis when a biopsy of a related mass in the neck is examined. Owing to the predominantly anterior position in the mediastinum of this group of tumors, especially the benign ones, the possibility of a tumor being an angioma ought to be considered whenever a patient presents with an anterior mediastinal shadow. In 7 cases the tumor was

merely an incidental radiological finding in essentially asymptomatic persons.

The commonest presenting features were pain in the chest, cough, and dyspnea, which are equally common in all mediastinal tumors and cysts and are nonspecific. Almost all asymptomatic patients had a benign tumor. Erosion of related ribs as seen by roentgenogram was observed in 2 cases and erosion of the vertebral bodies in 2 cases. These were all malignant cases. Fluoroscopy of the patient's chest showed transmitted pulsations in only a few cases. Angiocardiography proved rather disappointing as it failed to reveal the vascular nature of these tumors in those cases in which it was done. Probably this is due to the fact that the circulation of blood may be rather sluggish in the cavernous tissue of the neoplasms, which may also be partially obliterated by thrombosis. Tomography and kymography, when used, added very little to the information obtained by standard roentgenograms and fluoroscopy.

The basic structure of this group of tumors is composed of tubes, lined by endothelia, which are enclosed within sheaths of connective tissue fibers of varying density. A simple pathologic classification, based on embryologic and histologic differences, has much to recommend it. The majority of the benign members of this group of tumors is now considered developmental in origin. Whether they arise from sequestrated embryonic unipotent angioblastic tissue, as orginally postulated by Ribbert, or from excessive development of more or less normal vessels, as suggested by Ewing, is still disputed. They have been referred to by some pathologists as vascular hematomas, while the remaining tumors in this group are considered to originate as true neoplastic processes affecting the walls of the vessels and the supporting connective tissue. The true neoplastic group has been divided into two main types, each of which can be benign or malignant. First, there are the rare but interesting hemangiopericytomas which arise from the pericytes of Zimmerman, and second there are the hemangioendotheliomas in which the endothelial cells play the main role; they are arranged usually in more than one layer around vascular lumina. Probably most of the malignant tumors of blood vessels could be included in this group. The majority of multiple angiomatous tumors are believed to be multifocal lesions, frequently developmental in origin. This can explain the multiplicity of benign tumors in the mediastinum as well as in other sites such as the liver, spleen, or lung. These have long been referred to in the literature as "benign metastasizing" hemangiomas, an entity which is denied by some authors.

At thoracotomy, an angioma commonly presents as a well-defined encapsulated soft neoplasm which has a dark plum color and may be pulsating. But quite often it forms an extensive mass that almost fills an entire hemithorax, while the edges mingle with adjacent mediastinal tissues, giving the deceptive appearance of an infiltrative growth. In some cases it actually strangles some of the main vessels of the mediastinum such as the aorta or the superior vena cava. True invasion of the lumen of the pulmonary artery has been described. In some cases the nature of the tumor may not be disclosed until actual dissection of the mass is started or even until histologic examination is performed. Malignant angiomatous tumors may well be localized and encapsulated and easily shelled out at operation, although usually they tend to invade adjacent organs, erode related bones, and produce lymphatic and even blood-borne metastases.

There have been 9 cases of hemangioma of the pericardium. One of these patients presented a picture of acute cardiac tamponade without a history of trauma which was probably caused by an intrapericardial rupture of a pericardial angioma. There were 2 cases of hemangiopericytoma and glomus tumor reported in the mediastinum. The clinical picture of one case was interesting because the patient suffered from chest pain that had the characteristic paroxysmal nature of peripherally situated glomus tumors.

Surgical excision is certainly the treatment of choice in benign cases owing to their possible complications. It must be realized, however, that this may be a tedious procedure because of the infiltrative nature of some of these neoplasms, and substantial blood-loss may necessitate transfusion of several pints of whole blood. The desirability of a generous exposure cannot be over-emphasized and in two of the reported cases the second operation was necessary to gain a better access to the tumor. In some cases it may be advantageous to stage the operation to obtain complete excision. Irradiation therapy is not of much value in benign cases, as the tumor is not radiosensitive. For the malignant cases, total excision is the only chance for cure, probably more so if combined with radiotherapy. The latter alone may offer the patient with an inoperable growth some palliation, though the results are far from encouraging. Of the reviewed cases, 20 underwent operative removal of the tumor; 11 of these had complete removal, and 9 had only incomplete excision which was followed in 1 case by x-ray therapy. In 3 cases, only a biopsy was done because the tumor was considered inoperable or because the disease was widespread in the lungs and mediastinum. Though malignant tumors usually have a poor prognosis, in some cases a combination of excision and radiotherapy or even surgical excision alone can lead to 2 or 3 years' survival.

—*Donald M. Clough, M.D.*

Esophageal Webs. HANS K. WALDMANN and ANDREW TURNBULL. *Am. J. Roentg.*, 1957, 78: 567.

ESOPHAGEAL WEBS are either thin membranes which sweep partially across the lumen of the esophagus, or narrow encircling bands which cause stenosis of its upper portion. The webs have been considered to be a rare disease of the esophagus and have been thought to be associated with the Plummer-Vinson syndrome. However, many cases of Plummer-Vinson syndrome show no webs and the webs may occur without the presence of anemia or the syndrome.

Four cases of esophageal webs are reported and their etiology is discussed. The relationship of encircling membranes to carcinoma of the mouth, pharynx, and upper gastrointestinal tract is mentioned. It is believed that webs are more frequently found when a more careful search is made for them. Whenever a patient complains of dysphagia, roentgenograms of the upper esophagus during the active phase of degluti-

tion should be obtained. If the hypopharynx and upper esophagus are not fully distended during the exposure, webs might very easily be overlooked.

—*W. Foster Montgomery, M.D.*

The Esophageal Sphincters in Achalasia of the Cardia (Cardiospasm). BRIAN CREAMER, ARTHUR M. OLSEN, and CHARLES F. CODE. *Gastroenterology*, 1957, 33: 293.

THE NORMAL MOTOR RESPONSE to swallowing and the primary peristaltic wave of deglutition are altered in patients with achalasia. The sphincteric mechanism at the gastroesophageal junction is closely integrated with the reflex act of deglutition.

Pressure studies were made in 13 patients with proved achalasia, or cardiospasm. Pressures were recorded by electromagnetic transducers attached to polyethylene tubes placed in the esophagus, in the gastroesophageal zone, and in the stomach. In the control subjects as well as in patients with achalasia, the resting pressure showed rhythmic fluctuations due to the heart beat and respiration. The diaphragmatic hiatus was taken as the point of pressure change from positive to negative during inspiration. Pressure in the fundus of the stomach was taken as the base or zero pressure, and the pressures in the junction and in the esophagus were expressed in relation to the latter.

A barrier of high pressure was found to exist between the stomach and esophagus, which persisted through both phases of respiration. At the end of the expiration the pressure band was above the diaphragm, but after inspiration it moved down below the diaphragm. In normal persons, pressure at the junction was abolished by the swallowing act, while in patients with achalasia there was no relaxation and no fall of pressure during deglutition. In patients with achalasia, pressures in the pharyngoesophageal sphincter at rest and during deglutition were normal.

—*B. G. P. Shafiroff, M.D.*

MISCELLANEOUS

The Management of Substernal and Intrathoracic Goiters. BRIAN BLADES and PAUL C. ADKINS. *South. M. J.*, 1957, 50: 1123.

THE AUTHORS define a substernal goiter as one which is evident in the neck with obvious extension into the substernal space on roentgenologic examination. It may vary in size from an insignificant extension to a condition in which the major portion of the gland is behind the sternum. Substernal goiters can nearly always be removed by a cervical approach, while true intrathoracic goiters can be more easily removed through a transthoracic approach.

The diagnosis of a substernal goiter involves the recognition of the extension of the cervical goiter substernally into the superior mediastinum.

In true intrathoracic goiters the differential diagnosis involves consideration of the various tumors found in the anterior mediastinum. Occasionally these tumors encroach upon the aorta or innominate artery. Sometimes they displace the esophagus and trachea forward. In large goiters the superior vena cava may be partially occluded.

The goiter may be asymptomatic and accidentally discovered on routine roentgenologic examination. Tracheal pressure may be indicated by dyspnea, cough, stridor, or pressure on the esophagus by dysphagia. While radioiodine studies are indicated, they are not always helpful.

Unless the general condition of the patient contraindicates surgery, the very presence of a substernal or of an intrathoracic goiter is indication for an operation, before advancing age and a growing goiter increase the operative hazard.

Various surgical maneuvers were used for the removal of a very large substernal goiter, such as morcellation, sternum-splitting incision, and separate intercostal incisions to gain access to the tumors when direct cervical delivery was impossible.

When anesthesia was imperfect and speed was essential, these procedures were justifiable.

The authors look with disfavor upon splitting the sternum, even under today's conditions with antibiotics and blood replacement, because of the great postoperative pain and the frequent infections which follow despite the use of antibiotics.

If a substernal goiter cannot be delivered through the cervical incision under ideal anesthesia and ample blood replacement, an anterior thoracotomy through the second or third interspace is made. The tumor is dissected free under visual guidance and then delivered through the cervical incision. The intercostal incision can be closed under water-seal drainage of the pleural cavity. Drainage of the substernal space is mandatory, by soft rubber tissue drains brought out in the neck.

For the removal of large intrathoracic goiters lacking a cervical connection the authors recommend a posterolateral thoracotomy with an intercostal incision through the bed of the fourth or fifth rib on the appropriate side, usually the right.

The authors cite 2 cases, both in women, illustrating the management of (1) a large substernal, and (2) an intrathoracic goiter. —*Fred W. S. Modern, M.D.*

Respiratory Dead Space in Normal Persons and in Patients with Pulmonary Disease (Lo spazio morto respiratorio). *Atti Soc. lombard. sc. med.*, 1957, 12: 3.

FUNCTIONAL respiratory dead space is defined as the volume of air contained in the respiratory apparatus which does not participate in gaseous blood exchange. It is distinct from anatomical respiratory dead space.

Repeated determinations in 15 normal individuals revealed no statistically significant variations for each subject. Ten patients with pulmonary fibrosis or fibrothorax yielded similar findings with higher absolute values.

There was no correlation between the height of the subject and the size of the dead space.

From a series of over 300 determinations of functional respiratory dead space (Haldane's method) the author details four examples to illustrate that this volume may be increased absolutely or relatively as a result of pulmonary disease. Knowledge of these values plus that of the arterial oxygen saturation is helpful in the interpretation of pulmonary physiopathology.

Respiratory dead space was determined in 12 patients with giant cavities. In 7 an entire lobe was involved, in 3 both upper lobes were diseased, and in 2 almost an entire lung was replaced.

There was an average increase of 17 per cent in the dead space. This was believed to be due chiefly to exudation and fibrosis in the uninvolved pulmonary tissue. The increase in dead space was much less than might be expected from the extent of roentgenologic involvement and can only be explained by the little, if any, ventilation.

The authors find that the increased respiratory dead space in patients with pulmonary disease is compensated for by an increase in respiratory rate. This has been shown to be sufficient to satisfy resting metabolic demands. The unsaturation of arterial blood frequently observed in such patients is accordingly not an expression of tissue anoxia secondary to inadequate alveolar ventilation but rather the result of an alveolocapillary block in the pathologically involved areas of the lung. —*George L. Nardi, M.D.*

Postoperative Diaphragmatic Hernia; a Complication of Hiatus Hernia Repair; Report on 2 Cases. Bernard S. Loitman, Walter B. Hoover, Laurence Miscall, and John A. Evans. *Am. J. Roentg.*, 1957, 78: 633.

Dehiscence of the diaphragmatic counter incision is an unusual and serious complication following surgical repair of a hiatus hernia. The writers report 2 such cases. The symptoms in these cases consisted of pain (abdominal and thoracic), dyspnea and tachypnia, nausea and vomiting, hematemesis, tachycardia, fever, and shock. The symptoms may be very dramatic and suggest a chest condition rather than an abdominal one. Both patients' symptoms were different from their preoperative hiatus hernia symptoms and progressive.

The diagnosis should be suspected in all patients having had operative procedures involving the diaphragm who do not do well postoperatively. Upright roentgenograms (chest and abdomen) should be taken and the localization of air and fluid collections carefully determined. A double gas bubble or air containing loculus may be visualized, which indicates that the supra- and infradiaphragmatic portions of the stomach are involved. This may produce the appearance of a tilted hourglass with the constriction at the diaphragmatic defect. The supradiaphragmatic portion of the stomach may be obscured by a pleural effusion. Further studies with contrast media should be made immediately in suspected cases. A barium enema study will help to establish the diagnosis if the colon is also involved. In a convalescent patient single portable chest roentgenograms of poor technical quality may easily lead to erroneous conclusions and delayed diagnoses. The need for adequate coverage with technically good roentgenograms cannot be overemphasized.

The patient with the first case reported was reoperated upon on the eighth postoperative day and was found to have a volvulus of the herniated portion of the stomach which required resection. This patient died 3 hours later of a pulmonary embolus. The second patient was reoperated upon 3 months after repair of his hiatus hernia because of persistent vomiting and postprandial epigastric pain. Roentgenologic studies (including barium studies) revealed a normal hiatus with a large portion of the stomach in a supradiaphragmatic position which produced an hourglass configuration. At reoperation complete dehiscence of the diaphragmatic counterincision was found. This patient made an uneventful recovery from this operation.

This complication should be considered in the differential evaluation of the patient's condition following diaphragmatic surgery. Imbrication with mattress sutures is suggested as the method of choice in closing diaphragmatic incisions. —*Bernard C. Gerber, M.D.*

The Serious Significance of Hiatus Hernia. Elmer R. Maurer and Alfred M. Keirle. *Arch. Surg.*, 1957, 75: 647.

Three general varieties of esophageal hiatus hernia are ordinarily recognized—sliding hiatus hernia with a redundant esophagus, a congenitally short esophagus with an intrathoracic stomach, and a paraesophageal hiatus hernia (Fig. 1). The sliding variety of hiatus hernia is certainly the most common and is responsible for the great majority of the serious complications. Although the vast majority of hiatus hernias appear by roentgenographic examination to be associated with a truly short esophagus, in most instances it is usually discovered at the time of operation that there is an adequate length of esophagus and the stomach can usually be readily brought below the diaphragm.

Recent precise investigation into the anatomical and physiological behavior of esophageal hiatus hernia has demonstrated that the defect occurs constantly in one location. The esophageal hiatus has an anterior margin consisting of an unyielding rim of tissue, made up of the middle leaflet of the central tendon of the diaphragm. The lateral walls are composed of the two crura, which take origin from tendinous attachments on the anterolateral surfaces of the bodies of the first three lumbar vertebrae. The posterior aspect of the hiatus is notably free of any firm structure, and the area posterior to the esophagus consists of a triangular space that is bridged by thin areolar tissue. This has been referred to as the crural membrane. It is at this particular point that the abdominal contents protrude into the mediastinum and produce the hiatus hernia. Obliteration of this anatomically weak area is in essence the fundamental point in the repair of all hernias through the esophageal hiatus. The phrenoesophageal ligament attaches to the entire circumference of the esophagus approximately 2.5 cm. above the gastric junction. This structure covers the hiatus and attaches to the fibrous tissue on the inferior aspect of the diaphragm. The ligament is covered on its inferior surface by peritoneum. This stretched-out ligament, along with its peritoneal covering, makes up the wall of the sac in large hiatus hernias.

In a series of 57 cases of hiatus hernia producing symptoms reported by these authors, vomiting occurred in 19, or 33 per cent. Thirteen, or 22 per cent, of the patients had varying symptoms of dysphagia. Bleeding occurred in the same number of patients. In 6 patients, or 10 per cent, symptoms and signs of esophageal stricture developed. In another 6 cases, or 10 per cent, ulcer of the esophagus was shown. Intractable pain was found in 3 patients, or 5 per cent, who were so incapacitated that they were not able to carry out their usual occupation.

The growing accumulation of medical reports would seem to indicate that the incidence of carcinomatous changes in an ectopic thoracic stomach or in association with hiatus hernia is much higher than was previously supposed. Carcinoma complicating esophageal hiatus hernia was encountered by these authors in 2 of their patients, or 3 per cent of the series.

It is becoming increasingly apparent that peptic ulcer of the stomach or duodenum is a complication of hiatus hernia rather than a simple coincidental finding. It has been experimentally demonstrated that esophageal hiatus hernia greatly exaggerates the ulcer diathesis. This would explain the high incidence of resistance to adequate medical treatment of peptic ulcer seen in association with hiatus hernia. In the present series of cases, 7, or 12 per cent, of the series showed evidence of stomach or duodenal ulcer.

The authors generally prefer the transthoracic approach to all uncomplicated hiatus hernias because it gives the most rapid, immediate, and adequate exposure of the hiatus and permits a more definitive complete anatomical repair. They believe that the transthoracic approach is particularly indicated in obese persons with pendulous abdominal structures because of the obvious risk of postoperative ventral hernia, wound evisceration, and infection. With the transthoracic approach the operating time is definitely shorter, early ambulation is possible, and the convalescence appears to be smoother and more rapid. They do not believe that the general criticism that a transthoracic approach to hiatus hernia carries a greater risk is at all tenable.

The operation that they perform is carried out through the bed of the eighth rib with the patient in a right lateral prone position. The pulmonary ligament is divided up to the inferior pulmonary vein, and the mediastinal pleura overlying the hernia immediately above the hiatus is opened longitudinally. A sling of Penrose drain is placed about the esophagus, which is then retracted into the wound. The pleural covering of the herniated stomach and the soft areolar tissue of the mediastinum are brushed off the posterior aspect of the herniated stomach to expose the muscular edge of the hiatus. A 2.5 inch radial incision is made in the diaphragm, approximately 2 inches lateral to the anterior margin of the hiatus. A cuff of phrenoesophageal ligament with the attached peritoneum is left attached to the upper portion of the hernia, which is attached about the gastroesophageal margin. This cuff is eventually fixed to the under surface of the counter incision in the diaphragm to secure the thoracic stomach in its normal infradiaphragmatic position. A heavy suture of No. 1 or No. 2 cotton or silk is started in mattress fashion through the left crus of the diaphragm near the floor of the mediastinum. The suture then passes in reefing fashion through the attenuated decussating muscle fibers of the posterior portion of the hiatus and then from inside out through the right crus of the diaphragm. The mattress suture is completed by returning again through the right crus across the midline behind the esophagus and finally out through the left crus of the diaphragm. When this suture is tied in place even the largest hiatus is reduced snugly about the esophagus with complete obliteration of the posterior space. It is seldom necessary to place

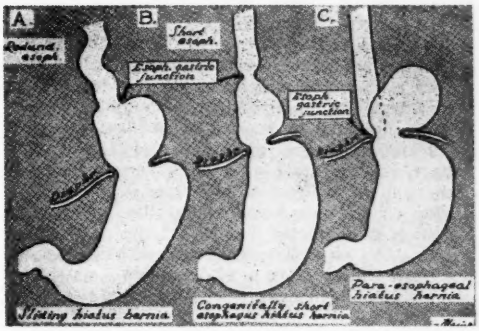

FIG. 1 (Maurer, Keirle). Classification of varieties of hiatus hernia.

more than one suture posterior to the esophagus, but additional sutures may be placed in those instances in which the defect is not completely closed by the mattress suture. The next important step in the operation is the careful adjustment of the size of the newly fashioned hiatus. This is easily accomplished by passing the index finger through the incision in the diaphragm and up through the hiatus anterior to the esophagus. If the hiatus is found to be too snug, several of the fibers of the anterior margin of the hiatal ring can be incised until the index finger passes freely through the hiatus along the esophagus, which contains a Levin tube. Interruption of the continuity of the phrenic nerve by crushing or section is not advised as it results in reduction of ventilatory reserve and adds nothing to the repair of the hernia.

In those instances in which the esophagus is congenitally short and adequate reduction of the stomach below the diaphragm is impossible, the esophageal hiatus is extended radially toward the dome of the diaphragm. The phrenic nerve is excised to produce permanent paralysis.

Of 41 hiatus hernias repaired by the transthoracic approach, 33 presented excellent, and 8 good, results. In 4 of the 8 patients listed as having a good result, preoperative strictures required an occasional dilatation. One patient developed a chylothorax which was cleared by thoracentesis in 4 days. This complication resulted from an attempt to obliterate the posterior triangular defect by suturing the crura down to the prevertebral fascia. After this experience with chylothorax, the authors have routinely used the reefing suture. —*Matthew H. Evoy, M.D.*

Thoracic Surgical Treatment of Mentally Ill Patients. OTTO L. BETTAG, JOSEPH LLOYD DE SILVA, and LEONARD KRASNER. *J. Internat. Coll. Surgeons*, 1957, 28: 460.

THIS STUDY was carried out at two hospitals operated by the Illinois Department of Public Welfare, where thoracic surgical treatment was available for a population of 48,000 mentally ill or retarded patients in various state institutions. The study embraced a statistical analysis of 238 major surgical procedures performed on 223 patients, and included 68 major operative procedures performed on 63 patients at one of

these hospitals. Newly detected pulmonary tuberculosis in these institutions decreased from 1.9 per cent in 1945 to 0.16 per cent in 1955. During this period the mortality rate due to tuberculosis declined 88 per cent and the incidence of new tuberculosis cases decreased 92 per cent. Other pulmonary problems, including lung abscess, bronchiectasis, empyema, foreign bodies, and benign and malignant tumors, were treated in this series. The usual variety of thoracic procedures was performed.

The authors acknowledge that the preoperative condition of mentally ill patients was a factor in selecting the type of surgical procedure. Diagnosis was often difficult because of the patients' unwillingness or inability to co-operate. Drug therapy was occasionally a problem. In tuberculosis cases, the usual medications were employed as indicated, although 2 patients became much more disturbed mentally on cycloserine. Bed rest was often difficult to enforce. Relatives of the patients were frequently unwilling to give consent for operative procedures. Some patients who were relatively co-operative before operation resisted treatment, refused to co-operate, or even became catatonic postoperatively. The care of these patients was hampered by inadequate or inexperienced nursing help.

Despite these medical difficulties there were only 2 deaths in the series of 63 patients, these being due to pulmonary edema following pneumonectomy for bronchogenic carcinoma. The major postoperative complication was atelectasis, which developed in 20 per cent of the cases. Vigorous therapy, including bronchoscopy and tracheostomy, prevented any mortality from this complication. There were 5 instances of postoperative empyema and 2 of bronchopleural fistula. Other complications included paralytic ileus, cardiac arrhythmia, and wound infection. The authors believe that surgical results in these mentally ill patients compare favorably with those in the general population. —*Emile L. Meine, Jr., M.D.*

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

An Analysis of 192 Consecutive Cases of Incisional Hernia. N. OBNEY. *Canad. M. Ass. J.*, 1957, 77: 463.

A SERIES of 192 incisional hernias is presented. The method of anesthesia, repair, and the results of repair are discussed.

Incisional hernias can be successfully repaired without the use of material such as wire mesh or fascia lata, provided the patients lose sufficient weight if they are overweight.

Age or physical condition is not a contraindication with the method of anesthesia used. There were no cases of postoperative shock.

Strong, monofilament, nonabsorbable suture material, such as wire, is essential.

—John J. Maloney, M.D.

GASTROINTESTINAL TRACT

Clinical Aspects of the Paralysis of the Gastrointestinal Tract (Internistische Gesichtspunkte der Laehmung des Magen-Darmkanals). H. BERNING. *Chirurg*, 1957, 28: 337.

THE REGULATORY DISTURBANCES of the gastrointestinal tract which lead to paralysis can be listed as follows:

1. Central paralysis (metabolic disturbances with ketonemia, such as diabetic coma, acetonemic vomiting, infectious diseases, inanition, exsiccosis, or brain tumor). The author observed marked atony and ectasia of the stomach in 90 per cent of the patients in diabetic coma. The condition is due to a central paralysis of the vagus nerve. It can be restored to normal within a short time following metabolic improvement.

2. Disturbances of neuromuscular transmission to the cells of Auerbach or inhibited response of the smooth musculature (probably potassium deficiency). Acute potassium deficiency is manifested by paresis of the small and especially of the large intestine. The effects of nonacute hypopotassemia can be largely compensated by the body.

3. Paresis of the vagus nerve in basal skull fracture, fracture of cervical spine, poliomyelitis, bronchial carcinoma, mediastinal tumor, or tabes dorsalis.

4. Reflex disturbances (abdominal inflammation, colic due to calculi, abdominal surgery, blunt abdominal traumas). They occur frequently and are mostly manifested by paresis of the intestine.

5. Local disturbances (organic disorders of the gastrointestinal tract) are not further discussed.

The article is illustrated by eight roentgenograms.

—Victor R. Jablokow, M.D.

Positive Stomach Diagnosis by Gastroscopic Biopsy. EDWARD B. BENEDICT. *Surg. Clin. N. America*, 1957, 37: 1239.

SINCE THE DEVELOPMENT of the Benedict flexible operating gastroscope in 1948 many gastroscopists have been using it frequently and have given favorable reports of their experiences. The importance of biopsy has long been realized in laryngoscopy, bronchoscopy, esophagoscopy, peritoneoscopy, cystoscopy, and proctoscopy. The advantages of the operating gastroscope are: biopsy of the stomach under direct vision, aspiration of gastric secretions, and inflation and deflation of the stomach at will. Aspiration of gastric secretions is now carried out by means of the operating gastroscope whenever it is desirable to clear away secretions and improve visibility or to aspirate secretions for cytologic study. Inflation and deflation of the stomach is an important method of determining the flexibility or rigidity of the stomach wall inasmuch as the presence of rigidity makes one suspicious of a neoplastic process. Repeated inflation and deflation at the will of the examiner is possible only by means of the special channel in the operating gastroscope.

With today's expert radiologists, gastroscopy is recommended only for the most difficult diagnostic problems. If the radiologist reports an obvious mass or an area of rigid infiltration, the gastroscopist is not called in consultation but the surgeon is asked to operate without delay.

Gastroscopy without biopsy is often a useful procedure, but gastroscopy with a positive histological diagnosis is better. The most valuable use of gastroscopic biopsy is in the differential diagnosis of lymphoma, carcinoma, and gastritis. In a good many such cases the history may be vague, the physical examination noncontributory, laboratory reports inconclusive, and x-ray studies may reveal only thick gastric rugae.

The exclusion of a malignant condition by gastroscopic biopsy is somewhat less satisfactory as it is well known that negative evidence is of much less value than positive evidence. When, however, the radiologist reports giant rugae suggestive of lymphoma or severe gastritis, it is helpful to pass the operating gastroscope, inflate and deflate the stomach as desired in order to determine flexibility or rigidity, and then to take several biopsies from different parts of the stomach. If these biopsies are reported to show gastritis with no evidence of cancer, it is probable that lymphoma, which is usually a fairly diffuse process, has been excluded as far as reasonably possible.

In this article 8 illustrative cases are presented to demonstrate the various uses of the flexible gastroscope, and some of these cases also present its limitations.

—Matthew H. Evoy, M.D.

The Efficacy of Medical Criteria in the Differentiation of Benign from Malignant Gastric Ulcers. HARVEY J. DWORKEN, HAROLD P. ROTH, and HERBERT C. DUBER. *Ann. Int. M.*, 1957, 47: 711.

THE AUTHORS subscribe to the reliability of a series of medical criteria involving a trial of therapy to differentiate benign from malignant gastric ulcers. One hundred and thirty-five patients in whom a diagnosis

of benign gastric ulcer was made are included in this study. The patients were followed up for a median period of 46 months. The final diagnosis of benign gastric ulcer was made on the basis of the following criteria: (1) benign appearance of the ulcer on roentgenography or gastroscopy, (2) the presence of free acid on gastric analysis, (3) complete relief of the symptoms on treatment, and (4) complete healing of the ulcer crater as shown roentgenologically. Ulcers were located in the body of the stomach in 47 cases, and in the antrum in 90 cases, a total of 137 ulcers in 135 patients. An adequate follow-up was obtained in 130 patients (96.4 per cent). Twenty-four persons had died from all causes. Two (1.5 per cent of those followed up) had died from carcinoma of the stomach, 4 from perforated peptic ulcer, 1 from serum hepatitis following gastric resection, and 17 from causes other than gastric ulcer or gastric cancer. Eleven patients died of myocardial infarction in the period of follow-up.

During the years in which this series of patients was accumulated, 27 other patients, at the same center, underwent gastric resection because of nonhealing of a gastric ulcer following a trial of medical therapy. In one of these patients the ulcer was malignant. Six other patients, operated upon because of an initial clinical or radiologic impression of possible carcinoma, were found to have benign ulcers. Gastric resections were performed on 9 more patients because of recurrent gastric ulcer within a 6 month period. All of the ulcers were benign. The case histories of the 2 patients in the present series who proved to have cancer of the stomach when operated upon are summarized in the article with emphasis on the fact that this diagnosis could not be made on the basis of symptomatology or radiologic impression. However, the failure to heal following good medical management is extremely important in the differentiation of these cases from benign ulcer. The authors believe that most mistakes are made in the differentiation of gastric cancer and benign ulcer because the patients are not followed up closely enough. There is failure to obtain a subsequent gastrointestinal roentgenogram after the patient has responded excellently to medical therapy. Benign gastric ulcers should be followed up until completely healed on x-ray examination. —*Lloyd D. MacLean, M.D.*

The Feasibility of Ulcer Removal; an Evaluation of Gastroduodenostomy. Earl A. Connolly, Arnold W. Lempka, and Claude H. Organ. *Ann. Surg.*, 1957, 146: 296.

The authors think that the Schoemaker-Billroth I subtotal gastrectomy combined with bilateral vagotomy is the best operation for peptic ulcer. The following reasons are given:

1. The operation is more physiologic, removing both antral and vagal stimulation, while the gastric pouch still empties into the duodenum.

2. The ulcer is removed, a factor of importance when a malignant condition is a possibility. If the indication for surgery is hemorrhage the bleeding point can be controlled.

3. The method gives protection against recurrent ulceration because the duodenum is equipped intrinsically to resist acid pepsin ulceration.

4. The blind duodenal stump and the associated dangers of stump blow-out and duodenal fistula are eliminated.

5. The technique is easier and faster.

6. There appears to be better nutrition when gastroduodenostomy is employed.

A total of 133 gastric resections were evaluated between January 1, 1951 and December 31, 1955. Eighty-five consecutive Billroth I procedures were performed beginning in April, 1953. Seventy-six patients had duodenal ulcer, 36 benign gastric ulcer, 14 gastric cancer, and 3 marginal ulcer.

The authors describe in detail the important technical aspects of the operation.

The final decision as to whether the Billroth I or Billroth II type of anastomosis is to be used is made only when this stage of the procedure is reached. If the remaining stomach and duodenum will reach each other and overlap by 2.5 cm. then a Billroth I anastomosis is used.

Postoperatively, gastric suction is continued until the fifth day. The authors think that this allows any traumatic pancreatitis, incidental to the operation, time to subside. Stimulation of the pancreas which might occur during feedings is avoided. Diarrhea was not common after vagotomy when the 5 days were allowed for the pancreas to regain its normal function.

Two deaths occurred in the series, a mortality rate of 1.5 per cent. Both deaths were due to cardiorenal postoperative complications. One patient developed stomal edema of marked degree, which was not completely relieved until the twenty-first postoperative day. A pancreatic fistula following operation for penetrating duodenal ulcer cleared without serious end results. Atelectasis was reported in only 4 patients; however, the authors believe that this constitutes the most common problem in the immediate postoperative period. Other complications included bleeding from the drain site in one instance, a transient hemiplegia, and a single occurrence of thrombophlebitis.

Because of the short interval of time elapsing since this procedure was instituted routinely, long term results are not available. —*M. C. Anderson, M.D.*

Simple Closure for Perforated Peptic Ulcer. J. J. McCaughan, Jr. and Ralph F. Bowers. *Surgery*, 1957, 42: 476.

The authors review 277 cases of perforated peptic ulcer observed in a 10 year period ending October 1, 1956 at the Veterans Administration Medical Teaching Group Hospital in Memphis, Tennessee. An attempt was made to evaluate simple closure for perforated peptic ulcer as compared to subtotal gastric resection as a primary procedure for the treatment of perforation. The authors state that advocates of resection have presented mortality figures varying from 0 to 13.6 per cent in favorable cases. They state that a favorable case means an early perforation of less than 8 to 10 hours' duration, preferably in a young person. However, these same operators subjected the less favorable and poorly conditioned patients to simple closure or plication, which they point out elevates the mortality rate for the latter procedure considerably but does not fairly represent the ability

of that procedure to save life. They briefly mention a third method of treatment for perforated ulcer, namely, the nonoperative method. The authors have used this 11 times, once mistakenly, in the belief that the diagnosis was acute cholecystitis, with a fatal outcome. In 10 other cases it was used when the correct diagnosis was made, but the ulcer had obviously sealed off and the patient was doing well. This has not been used in free perforation.

In comparing primary gastric resection with simple plication the authors studied the mortality, morbidity, and subsequent fate of the patients for early and late complications. Of the 277 perforations, 262 were treated by plication. There were 9 deaths in the total of 277 cases, but only 4 deaths occurred in the group that had simple closure or plication. The over-all hospital mortality for perforation of peptic ulcer was 3.2 per cent, but the mortality rate for the simple closure operation was 1.5 per cent. Analysis of the 4 deaths occurring in the simple closure group revealed that 2 died from overwhelming bacterial peritonitis. Both of these ulcers were plicated later. One patient died from a massive hemorrhage and one died of suppurative pericarditis 77 days following operation.

There were postoperative complications in 15.2 per cent of the cases, the most common conditions being wound infection, pelvic abscess, paralytic ileus, pyloric obstruction, and empyema. There were 2 instances of peritonitis and 3 instances of postoperative hemorrhage. The late complications were those associated with recurrence of the ulcer symptoms, which ranged from 50 to 55 per cent in this group, with an average follow-up time of 4.4 years.

The authors believe that closure or plication treatment is better than primary resection for the following reasons: (1) it is almost a certain fact that widespread use of resection cannot be made with the presently reported favorable mortality and morbidity with closure or plication, and (2) subtotal gastric resection has not been proved to be as successful in the permanent control of peptic ulcer as some workers believe and many hope. This is demonstrated by the increased interest in Billroth I resection, gastroenterostomy, and vagotomy, as well as other more specialized procedures. Poor results follow poorly selected cases for resection according to the authors. Since a primary resection is carried out in the face of an emergency situation, results may be poor in the long term follow-up. This is true particularly since poor permanent results are commonplace in the young, particularly those under 35 years, and in patients who are not properly oriented physically or mentally for gastric resection. Poor results are also seen in patients who are subjected to psychosomatic influences and in those who believe that gastric resection is a cure and will allow them to eat and drink as they wish.

The authors, therefore, conclude that since only 64 patients required subsequent operation for permanent control of the ulcer at the time of this report, primary resection may not be properly indicated since less than half of the total number of patients probably will never have to have gastric resection. This, coupled with the low mortality and morbidity in primary closure, makes the authors favor the latter procedure.

—*Peter Dineen, M.D.*

The Nonsurgical Treatment of Perforated Peptic Ulcer. HERMON TAYLOR. *Gastroenterology*, 1957, 33: 353.

A STUDY of the nonsurgical treatment of perforated peptic ulcer was carried out at King George Hospital over a period of 13 years, during which time 256 cases were observed. Of a total of 256 patients with perforations, 21 had an immediate operation, 27 had an intercurrent operation, and 208 were treated successfully by aspiration alone.

The clinical management of these patients is divided into four stages which are as follows:

In the first stage, which is carried out in the receiving room of the hospital, a diagnosis of perforation is made on clinical grounds. If an immediate diagnosis of perforation can be made, the first step is an intravenous injection of a quarter of a grain of morphine, which is repeated after 10 minutes if necessary. A stomach tube about 0.5 inch in diameter is used and the stomach is emptied by means of a suction bottle in order to make sure that all large particles of food are removed. The large tube is then withdrawn and a nasoesophageal catheter is passed. These procedures are often times followed by definite easing of the pain.

In the second stage a radiologic investigation is done. The roentgenogram is examined with three points in mind. Namely, to look for gas under the diaphragm to confirm the diagnosis, to look for a fluid level in the stomach which would mean that the aspiration of the stomach was faulty, and to make sure that the nasoesophageal tube is lying well in the stomach. A radiopaque nasogastric tube is used in order to visualize its course properly. If the tube is not properly placed in the stomach its position is rectified in the X-ray Department.

The third stage of treatment begins in the ward with a careful review of the situation. In 75 per cent of the cases, intraperitoneal gas will have been seen on the x-ray film and so has proved the diagnosis of perforation. The possibility that the perforation had occurred in another viscus is always kept in mind and the diagnosis is reviewed according to the patient's progress. If there are peritonitis and toxemia the patient is prepared for operation; otherwise, gastric suction is continued under close observation. Aspiration is carried out by a nurse every quarter hour, and later every half hour, with an ordinary syringe. In an uncomplicated case treated early, antibiotics are hardly necessary. An intravenous drip is set up to replace the amount of fluid and salt withdrawn from the stomach and supply the extra fluid requirements of the patient.

If there is a long history of dyspepsia and the patient is in good condition, partial gastrectomy may be done. With satisfactory aspiration the operation can be delayed up to 24 hours without any risk to the patient.

If it is decided to continue the treatment by aspiration, the progress is checked by further roentgenography after 12 hours in order (1) to establish the position of the tube and the efficacy of aspiration by the absence of a gastric fluid level and (2) to make sure that there is no increase in the quantity of gas under the diaphragm. If there is an increase in gas under the diaphragm, it would indicate that swallowed air

was passing through the perforation and preventing closure by the process of fibrinous adhesion. The length of time that aspiration of the stomach is needed will depend upon whether or not an ileus has occurred and, if so, on its degree. The suction is continued until peristalsis has returned. In an uncomplicated case recovery is quite uneventful. For a week or 10 days the patient is kept under observation to be sure that there is no undue collection of fluid in the peritoneal cavity. Often any collection of fluid is absorbed spontaneously. Usually the fluid is sterile; however, occasionally it may persist and become infected and it may be necessary to drain it early before a serious abscess is formed. In this series of cases 4 per cent of the patients had drainage instituted surgically, usually in the second week of treatment.

In the fourth stage, which is the final step, a full investigation is done. This investigation is done primarily to rule out any malignant condition in which gastric perforation has occurred. The incidence of cancer in this series has been 2.3 per cent of all perforations and 21 per cent of the perforations in the stomach.

There were 3 particular difficulties described in the nonsurgical method of treating perforations. The first is the deceptive appearance of a nasoesophageal tube which is thought to be in place, but in fact may not be. This difficulty is overcome by the use of radiopaque tubes and control x-ray examinations. The second difficulty is the intolerance of treatment by the patient, which is an indication for surgical closure of the perforation. The third difficulty is the air swallowing which may be habitual or induced by the irritation of the nasoesophageal catheter. This can be treated either by operation to close the perforation or by substituting a larger stomach tube for the nasoesophageal catheter.

In this series 13 cases of perforation were diagnosed as some other condition. All of these were operated on and the perforation was discovered and sutured. From the author's figures the errors of diagnosis was evenly balanced between the operators and the aspirators. On the one hand, the operators have the advantage of making sure of the diagnosis of an acute surgical condition, but, occasionally, they find themselves having unnecessarily opened the abdomen in an acute medical condition and doing harm to the patients thereby. On the other hand, although the aspirators do not harm the patients with acute medical conditions, they may incur a harmful delay in operation upon the patients who are suffering from an acute surgical condition other than a perforation. Error in diagnosis must involve some risk either way, and it is probably not confined to those who prefer not to operate on perforated ulcers. Although errors of diagnosis have occasionally been made they have not so far led to any fatality.

Of the 256 patients, 21 were treated surgically and 235 were treated by aspiration; 228 recovered. There were 28 deaths, or 11 per cent mortality; of these patients, 13 were operable and 15 were moribund when first seen. Of the 13, 4 were incorrectly managed, 3 died indirectly from the perforation, and only 3 died directly as the result of perforation. In none of the 9 fatal cases presented could the course of events have been improved by an operation to close the perforation.

There were 22 gastric ulcer perforations in this series, an incidence of only 9 per cent of the total. Seven of these patients died—a mortality of 25 per cent. Five of the 7 patients who died were moribund on admission. There were only 12 women in this series of 256 cases with perforations. The women with duodenal perforations did as well as the men.

There were 6 cases of perforated gastric carcinoma not included in the 256 cases. The incidence of cancer in the total of 28 perforated gastric ulcers was 21 per cent. A very remarkable difference in mortality was revealed when the perforations were divided into acute and chronic ulcer groups, respectively. The cases were separated into two groups according to whether the history of the indigestion before the perforation was less or more than of 3 months' duration. By this classification, there were 79 patients with acute ulcer perforations with only 2 deaths; this mortality rate in acute perforations is very low when the nonsurgical method is used (2.5 per cent). Among the 177 cases of perforated chronic ulcer, 26 deaths occurred—a mortality of 15 per cent. A 4 per cent mortality was added for subsequent deaths from recurrence, which made the over-all mortality in the chronic perforations 19 per cent. Thirty-nine of the cases of acute ulcer perforation were followed up for from 4 to 12 years, and all but 5 of the patients remained completely free from any kind of ulcer symptoms. Ninety-five of the cases of perforation in chronic ulcers were followed up for more than 4 years. Thirteen of the patients remained well, while 82 had subsequent ulcer symptoms. These symptoms were severe in 68, of whom 55 had a partial gastrectomy. After nonsurgical treatment of perforated chronic ulcer, therefore, there is a recurrent ulcer rate of no less than 85 per cent, a partial gastrectomy rate of 60 per cent, and an ulcer mortality rate of 4 per cent.

The author summarizes his findings by saying that when the ulcer is already chronic and scarred, it makes very little difference whether a perforation is treated by aspiration or by suture. Acute ulcers, however, which will generally heal without trace if treated nonsurgically, are very readily turned into chronic ulcers by the insertion of stitches into them. With regard to both mortality and ulcer relapse, the author's results with perforated acute ulcer have been much better than those with perforated chronic ulcer. These results make a very strong case for the performance of immediate partial gastrectomy for perforated chronic ulcer, but condemn it just as definitely for perforated acute ulcer. They also demonstrate the value of the nonsurgical method in avoiding the serious degree of ulcer relapse which occurs when acute ulcers are operated upon.

In conclusion, when good hospital facilities are available the selection of treatment for perforated peptic ulcer may be determined by the degree of illness of the patient and by the duration of his previous dyspepsia. If the patient is ill from general peritonitis and toxemia, the operation of removing the toxic fluid and closing the perforation with an omental graft will probably give him the best chance of survival. If he is ill from some unrelated disease, but has

a perforation as well, aspiration of the stomach is indicated. On the other hand, if the patient is not ill and has had no serious degree of ulcer symptoms before the perforation, treatment should consist of aspiration so that he will not only survive but will avoid subsequent ulcer trouble. If there has been a long history of indigestion and the patient is in good condition, immediate partial gastrectomy will probably give him the best chance for recovery from the immediate crisis and prevent the danger and disability from persisting ulceration.

—*John E. Karabin, M.D.*

Conservative Surgical Treatment of All Gastric Ulcers. FRED R. DENKEWALTER and ROBERT N. WATMAN. *Arch. Surg.*, 1957, 75: 558.

MOST PATIENTS with gastric ulcers of undetermined etiology are initially managed by a specified period of medical management followed by re-evaluation. If the lesion has failed to heal within the prescribed time limit, surgical treatment with the employment of a radical gastrectomy is customarily advocated. The authors question the validity of this concept of management, and offer a different and more conservative approach to this problem on the basis of their own experience and that available in the published reports of others.

The cases of 112 patients surgically managed for primary gastric ulcer during a recent 6 year period were carefully reviewed. Patients showing lesions with apparent clinical or radiologic evidence of malignancy were excluded, and it was found that 81 per cent proved to have benign surgical ulcers and 19 per cent, carcinoma. Analysis of the size and location of the benign and malignant gastric ulcers showed definite differences, as previously reported by others, but the overlap was such that these criteria were not reliable in differential diagnosis of the individual case.

The correlation of the final pathological diagnosis with the preoperative diagnosis made by radiologic and gastroscopic means in this series of cases disclosed a considerable incidence of error or, at least, of doubt, In this regard even the judgment of the surgeon at the operating table is not infallible, as in this series the operating surgeon believed 71 per cent of the malignant ulcers to be malignant, and 29 per cent of them to be benign while the permanent pathological diagnosis proved the latter to be malignant.

Exclusive of the patients with free perforation, in whom biopsy and simple closure were performed, 92 per cent of the patients with benign ulcers had definitive resection, and only 8 per cent had other definitive procedures. Of the resections, 62 per cent were 70 per cent or greater gastric resections, and the mortality was 6.8 per cent with an incidence of serious postoperative complications of 13.6 per cent. The mortality rate for less extensive resections was 3.3 per cent with a complication rate of 10 per cent.

In a follow-up group of patients with benign ulcers, 46 per cent of those with resections of 70 per cent or greater had significant undesirable symptoms, whereas of those with lesser resections only 5 per cent had significant undesirable symptoms.

Of the 21 patients with malignant gastric ulcers, 5 had resections within 2 years of this report. Of the remaining 16, 12 have died. It was of interest that on the basis of a relatively few patients, the more radical type of gastrectomy did not improve the result in the patients with lesions in the antrum.

The patients with medically treated gastric ulcers reveal serious deficiences in this method. Of one fairly large series treated medically, 42 per cent required later operation, and only one-third were controlled as "cured" for a 5 year period. The incidence of cancer in these patients later coming to surgery ranged from 25 to 30 per cent. On the other hand, although the radical surgical approach to all gastric ulcers has undoubtedly led to the salvage of many cases of gastric cancer which otherwise would have had a much poorer prognosis, this approach also results in the loss of a definite percentage of patients due to operative mortality and to a considerable morbidity from serious postoperative complications and nutritional and postgastrectomy symptoms.

Since the over-all results of the radical surgical approach to all gastric ulcers are far from encouraging, and medical management of the patients is similarly discouraging, the authors propose the following program:

1. Complete local wide excision of all questionable gastric ulcerative lesions.
2. A meticulous frozen tissue examination of the total lesion.
3. Vagotomy with antral drainage or, preferably, antral resection for benign lesions.
4. Extensive gastric resection for malignant lesions.
5. Prompt operative treatment for all gastric ulcers in the absence of specific contraindication to surgery. This is acceptable only in light of the lowered mortality and morbidity rates from less extensive procedures.

—*E. Thomas Boles, Jr., M.D.*

The Value of Cytology in the Diagnosis of Gastric Cancer. JOHN F. SEYBOLT and GEORGE N. PAPANICOLAOU. *Gastroenterology*, 1957, 33: 369.

EXFOLIATIVE CYTOLOGY has offered considerable promise in the diagnosis of gastric cancer and the realization of its ultimate possibilities is continually being investigated. Success of cytologic diagnosis of cancer will depend upon the presence of malignant cells in the smears and the recognition of these cells for what they are. In this series a total of 631 specimens were analyzed, of which 29 were excluded because the specimens were unsatisfactory or there was a lack of adequate follow-up. In 18 of the exclusions, improper cleansing of the stomach prior to the collecting procedure led to unsatisfactory results; thus no cytologic evaluation was possible. The remaining 11 lacked the necessary follow-up information. The 603 remaining specimens examined revealed that 120 of these either proved to have cancer at operation or were diagnosed as positive for cancer on the basis of definite clinical findings. All but 16 of the patients underwent surgery, at least to the extent of being explored by laparotomy.

The great majority of cases in this series were hospitalized patients having some complaints referable to the gastrointestinal tract and to the stomach in particular. These patients presented a relatively high incidence of gastric cancer, often in an advanced

stage, and indeed in a few the diagnosis had already been established clinically prior to the cytologic study. These were included not so much for diagnostic purposes as for supplying standards for testing the method.

The authors have classified these cytologic findings on the basis of the following scheme: class 1—negative; class 2—atypical cells present but not giving a suspicion of a malignant condition; class 3—cells present giving suspicion of a malignant condition; class 4—fairly conclusive evidence of a malignant neoplasm; class 5—conclusive evidence of a malignant neoplasm.

The use of the abrasive balloon technique in the diagnosis of gastric cancer has been shown by a very rigid objective analysis of results to produce accurate positive reports in 66 per cent of 117 cases of gastric cancer, not including the 19 per cent reported as "suspicious." The errors included 15 per cent of the cancerous cases in which no tumor cells were found in the smears, and one false positive result in a group of 485 patients without gastric cancer. Comparing these results with the roentenographic findings, it was found that of the 114 cases of gastric cancer which were examined by both techniques, 66 per cent were correct cytologically while 68.5 per cent were correctly reported by the radiologist. However, each technique contributed an additional number of cases which were missed by the other method so that a total of 88.7 per cent were correctly diagnosed as positive gastric neoplasms by one or the other procedure, or by both. Of the 53 cases which were considered operable, 53 per cent were given correct positive reports on the basis of the cytologic findings. The false negative findings were not explained satisfactorily in all cases, but in some instances they were accounted for not on the basis of the size of the lesion but on its location (antral, submucosal, and surface characteristics overlaid by necrotic material). Although the percentage of correct positive cytologic reports of the group with cancer of the stomach indicates room for further improvement, it is comparable to the results obtained with x-rays.

—*John E. Karabin, M.D.*

Gastrectomy with Resection of the Left Lobe of the Liver in Infiltrating Carcinomas of the Stomach (La gastrectomia allargata alla resezione parziale tipica del fegato nella sua infiltrazione da cancro dello stomaco). M. Mancuso, G. Del Grande, and E. Natalini. *Policlinico, sez. chir.*, 1957, 64: 151.

It is not always possible to determine the extent of infiltration by carcinoma of the stomach by the available clinical and laboratory examinations. At the time of exploratory laparotomy, signs of infiltration into the left lobe of the liver are a contraindication to radical resection of the tumor mass.

The authors report 3 cases in which exploratory laparotomy revealed infiltration of the left lobe of the liver. In this series, the left lobe of the liver was removed in toto with the tumor mass. The liver was resected to the left of the sagittal ligament along the porta hepatis with preservation of the fourth lobe. The liver bed was transfixed with sutures over a fibrin sponge to produce hemostasis. The postoperative course was smooth and uneventful. The postoperative liver function tests revealed no abnormalities.

On the basis of these results, the authors believe that infiltration of the left lobe of the liver is not a contraindication to radical gastrectomy. The left lobe of the liver can be removed successfully. The authors report only the immediate postoperative results.

—*Roland A. Manfredi, M.D.*

Complications of Gastric Resection (Contributo allo studio delle complicanze immediate e precoci della resezione gastrica). A. Bayon, M. Petrina, and A. Costa. *Acta chir. ital.*, 1957, 13: 349.

The authors present a collective review and thoroughly discuss the various complications of gastric resection. Obstruction at the stoma is discussed first and this is followed by a discussion of disturbances in the afferent loop. Duodenal and gastrojejunal fistula, postoperative hemorrhage, postoperative peritonitis, pancreatic complications, biliary and hepatic complications, gastroileostomy, vascular lesions, enterocolitis, acute postoperative peptic ulcer, tetanus, and phlegmonous gastritis are discussed in this order.

Particular stress is placed on making an exact diagnosis if possible. Treatment of the complications may be medical or surgical. When surgery must be resorted to, reintervention should not be delayed too long as early operation may be lifesaving.

The authors point out that the surgeon should be particularly careful about his technique and he should be able to cope with special situations such as penetration of the ulcer into the pancreas or extensive periulcerous inflammation. Most of the postoperative complications are considered to be due to technical errors.

The author emphasizes that a knowledge of eventual complications is necessary in order that a further reduction of the already low mortality may be obtained and to improve the late results of gastric resection.

—*Lucian J. Fronduti, M.D.*

Osteomalacia Following Gastric Surgery. I. McLean Baird and Samuel Oleesky. *Gastroenterology*, 1957, 33: 284.

Steatorrhea is a well known complication of gastric surgery and, in particular, of partial gastrectomy. Osteomalacia as a result of such steatorrhea has rarely been described. The authors describe 4 cases of osteomalacia due to steatorrhea following gastric surgery. An additional case is also presented, in which a partial gastrectomy in the presence of chronic pancreatitis produced steatorrhea and osteomalacia.

The authors are surprised at the paucity of reports on osteomalacia due to steatorrhea following gastric surgery. In view of the frequency with which partial gastrectomy is performed, and even if the incidence of subsequent steatorrhea is low, there must be many cases of undiagnosed osteomalacia. Many of the patients must carry a label of rheumatism, a diagnosis often given to the undiagnosed osteomalacic patient no matter how the osteomalacia has developed. Any patient complaining of multiple aches and pains after partial gastrectomy or gastroenterostomy should be suspected of having osteomalacia. The serum cal-

cium, inorganic phosphate, and alkaline phosphatase should be estimated, x-ray examination of the bones should be made, and, if necessary, a bone biopsy should be performed.

The abnormal physiology in these cases must be the malabsorption of vitamin D and calcium due to the steatorrhea. The osteomalacia takes at least 2 years to develop after the gastrectomy, a period similar to that found in patients with osteomalacia associated with the steatorrhea of obstructive jaundice. Treatment should consist of high doses of vitamin D (100,000 to 200,000 units) together with 5 to 10 mgm. of calcium lactate daily. There is no need to give high doses of vitamin D routinely after gastric surgery; indeed, such practice would be dangerous.

—*Harold L. Method, M.D.*

Novobiocin and Novobiocin-Neomycin for Intestinal Antisepsis. ISIDORE COHN, JR. and ALFRED B. LONGACRE. *Ann. Surg.*, 1957, 146: 184.

NOVOBIOCIN AND NOVOBIOCIN combined with neomycin were evaluated as a means of preoperative colon preparation.

Control stools were obtained, after which the patients were given a laxative and daily enemas to mechanically cleanse the bowel. During the therapy, stools, which were collected each day, were subjected immediately to bacteriologic analysis, and the drug sensitivities of each organism recovered were evaluated.

Five patients received 250 mgm. of novobiocin every 4 hours for 72 hours. The response of the coliform organisms, bacteroides, and clostridia was unsatisfactory, and streptococci responded only partially. For this reason it was thought that novobiocin was an unsatisfactory agent.

Five cases were studied with a combination of 250 mgm. of novobiocin and 1 gm. of neomycin given every hour for 4 hours and then every 6 hours for 72 hours. This produced a rapid and satisfactory control of 5 groups of organisms intensively studied. Staphylococci were found in only two control specimens which made evaluation of the drug activity against this species somewhat difficult. Novobiocin, however, is primarily effective against staphylococci, an action that further enhances the advantages of this combination over broad spectrum antibiotics which carry the additional risk of micrococcal enteritis.

—*M. C. Anderson, M.D.*

Present Trends in Surgical Treatment of Diverticulitis. EDWARD S. JUDD and MEREDITH P. SMITH. *Surg. Clin. N. America*, 1957, 37: 1019.

IMPROVEMENTS IN ANESTHESIA, preoperative and postoperative care, antibiotic therapy, maintenance of fluid balance, and blood transfusion have made operation feasible in diverticulitis more often than it used to be, and the proportion of one-stage operations is increasing. Study was made of 424 cases in which operation was done at the Mayo Clinic in the decade 1946 through 1955. One-stage resection was employed in 113 cases, of which 87 per cent were seen in the last 6 years of the 10.

As they appear in retrospect, the chief indications for operation in the 113 individual cases were the question of a malignant condition (37), recurring attacks of diverticulitis (27), a fistula (24), and an extrarectal mass (14). Resection is recommended if there is any question of carcinoma associated with diverticulitis. Recurrent attacks of diverticulitis are more readily challenged now than formerly with resection at an elective interval. A threat to the urinary bladder is a very forceful indication for immediate surgical intervention.

The two-stage operation still is used whenever an indication seems to be present. Any serious inflammatory threat to the ureter, iliac vessels, or any other vital structure is cause for proximal transverse colostomy rather than resection. Lesser inflammatory change sometimes is met with the Rankin modification of the Mikulicz operation. Very occasionally at the time of definitive left hemicolectomy it seems feasible now to remove a preliminary stoma of the descending colon or upper part of the sigmoid.

Among the 113 cases with single-stage operation one death occurred; it was totally unrelated to the disease or operation. Postoperative complications in considerable variety developed, with infection of the wound affecting 5 patients, fecal fistula 4, and intestinal obstruction 3; some half dozen other entities occurred less frequently.

Retroperitoneal Duodenal Rupture (Ein Beitrag zur Kenntnis der retroperitonealen Duodenalruptur). P. WURNIG. *Klin Med.*, Wien, 1957, 12: 285.

RETROPERITONEAL DUODENAL RUPTURE is the typical injury of the duodenum in case of blunt abdominal trauma. The condition is infrequent but is accompanied by high mortality. In 1952 a mortality of 20 per cent of the cases which were operated upon was reported.

The peculiarity of the duodenal rupture is due to the anatomical fact that the duodenal wall has its weakest spot in the posterior wall where the peritoneal cover is lacking. In case of traumatic rupture the duodenal contents flow into the retroperitoneal space causing a retroperitoneal phlegmon which enlarges rapidly. The symptoms develop slowly, without the signs of a generalized peritonitis, and the operation often is done too late. Even during operation the injury may be easily overlooked. The typical symptoms of duodenal rupture are a bilious hematoma, possibly with emphysematous bubbles, located in the hepatoduodenal ligament or at the root of the mesocolon, and also, at the same place, a dirty gray effusion. An edematous or bloody infiltration of the posterior peritoneum above the duodenum is also pathognomonic.

The duodenum is mobilized and a gastroenterostomy or, preferably, a Billroth II gastric resection is performed. There are drawbacks to both methods.

In recent years the mortality of retroperitoneal duodenal rupture has dropped considerably because of the use of antibiotics and endoduodenal continuous suction, which diminishes the dangers of suture insufficiency and allows a double suture of the rupture instead of gastroenterostomy or the Billroth II resection. One case of retroperitoneal duodenal rupture in which surgical treatment was successful is described.

—*Victor R. Jablokow, M.D.*

Postbulbar Duodenal Ulcer. JOHN A. RAMSDELL, LLOYD G. BARTHOLOMEW, JAMES C. CAIN, and GEORGE D. DAVIS. *Ann. Int. M.*, 1957, 47: 700.

THE AUTHORS present 99 cases of postbulbar duodenal ulcer observed over a 25 year period at the Mayo Clinic. Approximately 200 cases have been reported in the English literature in this century.

Anatomists have divided the duodenum into four major components. Roentgenologists agree with this subdivision, but have further divided the first portion of the duodenum into the cap or bulb, and the postbulbar portion which is the more variable structure of the two. Hence, one should not think of the first portion and the cap as synonymous, nor, conversely, should one think that a postbulbar ulcer necessarily is in the descending limb. Photographs of x-ray films are presented to support this concept. Close attention during fluoroscopic examination is mandatory if the diagnosis is to be made accurately. The distal portion of the duodenum is not always easy to study even in normal subjects as peristaltic activity may propel a bolus of barium through it too rapidly. Placing the patient in a prone right oblique position to overcome projectional difficulties and obtain a longer look at the structure is helpful.

In this series of 99 cases, there were 86 men and 13 women. The average age of the patients at the time of diagnosis was 50 years, the range being from 20 to 74 years. Symptoms began as early as age 10 and as late as age 69. The outstanding clinical symptom was abdominal pain, which occurred in 83 of the patients. No clinical differentiation in the type of pain encountered in patients with postbulbar duodenal ulcer and in patients with bulbar duodenal ulcer was perceptible. An outstanding feature of this very large series of postbulbar duodenal ulcer patients was the high incidence of complications. Foremost among these was gastrointestinal bleeding, which occurred in 38 patients. This is approximately twice the expected incidence in routine duodenal ulcer. Sixteen patients had hematemesis on one or more occasions, and 37 patients had one or more episodes of melena. Clinical and roentgenographic evidence of obstruction was present in 14 patients, and this was complete in 4 instances. Physical examination was of no value in establishing the diagnosis. Dependence upon roentgenographic examination for the diagnosis of postbulbar duodenal ulcer is necessary; it was obtained in all 99 cases. This diagnosis was made on the first examination in 65 of the patients. It was necessary to have a second examination in 30 cases, and a third examination in 4 cases, before the ulcer was visualized. The severity and organic nature of the symptoms prompted the clinician to request these repeated roentgenographic examinations.

Seventy-nine of the patients were treated with a medical regimen. The remaining 20 had symptoms or complications of such severity that immediate operation was performed. Follow-up of the 79 medically treated patients revealed that 10 were asymptomatic, 27 definitely benefited, 9 unchanged, and 10 definitely worse. Nine of the last-mentioned 10 patients had symptoms of such severity that they eventually required surgical treatment. Of the 20 surgically treated patients, 15 underwent partial gastric resection and 5 gastroenterostomy. Postoperative complications included subdiaphragmatic abscess in 2 patients, and thrombophlebitis in 1 patient. Prolonged follow-up revealed marginal ulceration in 4 patients; in one of these gastrointestinal bleeding occurred and in another a gastrocolic fistula eventually developed. A fifth patient had gastrointestinal bleeding without demonstrable evidence of recurrent ulceration. There were no immediate postoperative deaths. The authors do not state whether or not the recurrent ulcers occurred solely in the patients who had gastroenterostomy.

Perforation of a postbulbar duodenal ulcer apparently is rare. There was 1 perforation in this series. The location appears to predispose rather to penetration into the neighboring organs, particularly the pancreas, which was noted on 5 occasions at operation. Postbulbar duodenal ulcer has followed the administration of steroid hormones.

The authors recommend medical management of postbulbar duodenal ulcer despite the higher incidence of complications in these patients.

—Lloyd D. MacLean, M.D.

Ileocecal Intussusception in the Adult. LEO S. FIGIEL and STEVEN J. FIGIEL. *Am. J. Roentg.*, 1957, 78: 662.

INTUSSUSCEPTION occurs most commonly in young children. unassociated with other underlying disease. Intussusception in the adult usually occurs secondarily to pre-existing disease of some type. In the ileocecal form the ileum or ileocecal valve spearheads the process and there is an associated invagination of the cecum and a variable length of the colon. Intussusception is much more difficult to recognize in the adult than in infants and children, especially when early or minimal degrees of ileocecal intussusception exist. In the adult ileocecal intussusception will not always produce a clear-cut clinical picture of intestinal obstruction, nor will it always produce the classic roentgenographic pattern on the barium enema study.

The authors present 8 cases, in 4 of which the intussusception was associated with fairly clear evidence of intestinal obstruction and an underlying lesion was discovered in the terminal ileal segment at the time of surgery. In none of these cases was the terminal ileum filled at the barium enema study. In the other 4 cases the symptoms were vague and consisted primarily of minimal localized cramping pain in the right lower quadrant. In these cases the terminal ileum filled during the barium enema study and the defect which was produced as a result of the intussusception was found to be quite variable in appearance.

In the classic case there is a mushroom-shaped defect at the cecal base and the barium-filled terminal ileum enters the defect from below. Often the postevacuation films demonstrate the disappearance of the previously noted defect and a normally located ileocecal valve. Accurate roentgen diagnosis of physiologic degrees of ileocecal intussusception may be aided by postevacuation films and will aid in eliminating unnecessary surgical procedures based on erroneous roentgen interpretation of defects in this area.

—Bernard C. Gerber, M.D.

Appendical Fistulas and Calculi; Review of the Literature and a Report of 3 Cases. THORD KJELLMAN. *Acta chir. scand.*, 1957, 113: 123.

THE AUTHOR'S ARTICLE is based on 3 unusual cases of appendical fistula. Three complete case reports are presented, and roentgenograms are reproduced to support the main thesis. A number of references are appended, and historical verification is interspersed. The purpose of the article is to correlate the roentgen findings of appendical calculus with the antecedent and immediate symptoms which might suggest a diagnosis. The pathogenesis is discussed, and comment is made concerning the author's 3 personal cases.

In the literature 50 cases of appendical fistula have been reported. Forty of these fistulas communicated with the bladder. The author reports the first case of appendicoduodenal fistula. The 2 other cases were classified as appendicoileal, and appendicocecal. In 2 of his cases appendical calculi were demonstrable. Probably most of the fistulas develop secondarily to acute inflammatory reactions in the appendix distal to a calculus. The appendix becomes adherent to a viscus (or abdominal wall) and subsequently erodes the now contiguous structure. The fistula persists if the stone does not pass. Spontaneous closure is likely upon passage of the stone into a viscus.

The first case (appendicoduodenal) had a protracted history. The initial attack of appendicitis occurred many years prior to the development of the fistula, which probably occurred 19 years later, after a second acute appendicitis. The subsequent repeated attacks of gastrointestinal derangements resulted from recurrent inflammation in the region of the appendical calculus with passage of feces into the duodenum. In the second case (appendicoileal fistula) the initial acute episode must have had a "silent" course. There were no signs of inflammation at the time of operation, however roentgen ray examination of the abdomen revealed a laminated appendical stone.

The preoperative diagnosis of appendical fistula is difficult. Abdominal findings do not usually dictate early exploration. The acute attack of appendicitis may have occurred years before. The diagnosis is more likely to be made in the cases in which the fistula is located "high" in the gastrointestinal tract. Appendicovesical fistulas may be easily diagnosed because of the passage of flatus or feces per urethra.

Appendical calculus has been reported in as many as 80 per cent of cases of gangrenous appendicitis. In cases of acute appendicitis appendical calculi have been detected in from 4 to 15 per cent of cases. The roentgen diagnosis of appendical calculosis is based on several factors: the location of the opacity in the right lower quadrant (many exceptions), lamination of the stone, and tenderness over the area on fluoroscopy.

Because of the frequency of subsequent acute appendicitis in patients known to have appendical calculi, and because of the frequent association of calculus with gangrenous appendicitis, the authors unhesitatingly recommend appendectomy when appendical stones can be demonstrated. In fact, they believe that this is more of an indication for an operation than stones in the gallbladder.

—R. L. Lawton, M.D.

Acute Solitary Ulcer and Diverticulitis of the Cecum. R. A. PARKER and J. C. B. SERJEANT. *Brit. J. Surg.*, 1957, 45: 19.

SIX CASES of isolated acute cecal lesions are described, consisting of 3 cases of acute solitary ulcer and 3 of inflammation in a solitary diverticulum in the cecum. The ulcers or the diverticula in which they were located were excised in the majority of instances and the defect was closed in some cases after the cecum was opened to exclude a neoplasm.

The histologic changes suggested an acute inflammatory process. The site of the ulcer usually was on the cecal wall at the level of the ileocecal valve and it appeared possible that the initial breach of the mucosa leading to inflammatory changes was in some way connected with the presence of the ileocecal valve. Vascular changes in 2 cases, and thrombosis of the neighboring veins with arterial thrombosis in the other were thought to be secondary to the inflammatory changes and not causally related. The symptoms in the solitary diverticulum were caused by acute inflammation, usually associated with a fecalith. The diverticula were considered to be congenital in this series. Four of the 6 cases were diagnosed as appendicitis. Many such cecal ulcers may heal spontaneously and some may recur as in the case of one of these patients.

The authors recommend that an acute cecal ulcer found at laparotomy should be oversewn, whether perforated or not, as the possibility of perforation is considerable. Drainage is usually advisable when perforation has occurred. The inflamed solitary diverticulum should be incised or inverted with oversewing of the cecal wall. In both conditions, when inflammation has spread with a severely inflamed or necrotic cecal wall, part of the wall or a segment of the whole circumference of the bowel should be excised. Right hemicolectomy is reserved for those cases in which carcinoma cannot be excluded or the inflammatory process has extended to the formation of a mass.

—Allan D. Callow, M.D.

The Long-Term Treatment of Ulcerative Colitis with Hydrocortisone, Prednisone, and Prednisolone. JOHN M. ELLIOTT and JOHN V. CARBONE. *Gastroenterology*, 1957, 33: 423.

DESPITE THE INITIAL FAVORABLE EFFECTS of corticotrophin and corticoids in the short-term treatment of ulcerative colitis, prompt recurrences are the rule. Since improvement of any degree is important in this recalcitrant disease, further investigations were undertaken to determine the effect of larger doses over a longer period. In a number of these studies the occurrence of serious side reactions has been reported and the actual and potential hazards of corticoid therapy have been given attention. The encouraging results of their previous work prompted the authors to evaluate the effect of the prolonged use of corticoids on the course of ulcerative colitis in a group of patients treated during the past 5 years.

Thirty patients with ulcerative colitis, all of whom had failed to respond to previous medical measures, were studied in a large university hospital or a large general hospital in San Francisco. Treatment consisted of the administration of hydrocortisone, predni-

sone, or prednisolone, and in some cases adrenocorticotrophic hormone (ACTH). Additional measures included parenteral infusions of fluids, electrolytes, and blood to the more severely ill patients and administration of antibiotics to patients who showed evidence of impending perforation.

Dosage was based on the amount needed to produce a favorable effect in the individual patient. No rigid dose schedule was established. In general, an average initial dose of 300 to 400 mgm. of hydrocortisone was used, tapered to 20 to 100 mgm. a day to maintain a favorable course, or an initial dose of 40 to 60 mgm. of prednisone or prednisolone, with a maintenance dose of 15 to 40 mgm. daily. The latter two agents, which appeared to be similar in effect, were used interchangeably. ACTH, from 15 to 20 U. S. P. units intravenously daily, was administered only to acutely ill patients. It was given early in the course and for very short periods.

Results indicate that the duration of the colitis is important, not only in selecting treatment but, in some cases at least, in predicting its outcome. In this series, all instances of apparent remission or significant improvement occurred in cases of less than 2 years' duration. Thus, patients suffering from acute ulcerative colitis, which is unresponsive to other forms of treatment and which has not lasted long enough to cause permanent anatomic distortion of the bowel, are probably the best subjects for corticoid therapy.

A corticoid-induced remission can be expected in at least some cases of less than 2 years' duration, but only, it should be emphasized, if treatment is continued for a sufficiently long period. Clinical evidence of improvement is not enough to warrant cessation of therapy. Corticoids should be discontinued only after the following criteria are met: normal sigmoidoscopic examination, improvement as shown by roentgenography, normal bowel habits, negative tests for occult blood in the feces, normal leucocyte counts and erythrocyte sedimentation rate, and absence of anemia. Recurrence of colitis can almost certainly be expected if these requirements are not satisfied. An analogous situation is found in the strict criteria of cure employed in the modern chemotherapy of tuberculosis. When possible, patients were treated for several months beyond the time the disease process appeared to be completely quiescent. Only then was the dosage gradually lowered.

Because of the wide variation in response in individual patients, no rigid criteria for determining the dosage were established. Patients were given the amount necessary to produce and maintain a favorable effect. Premature lessening of the dose, however, caused an almost predictable "breakthrough," which suggested that dosage schedules should be continued at fairly high levels for extended periods. The attempt was made to lower the dose cautiously to the point where the disease was controlled and the side effects were minimal.

In almost all of the patients, including those who were gravely ill, benefit (if any occurred) was apparent in about 5 days. If no benefit was obtained in this period, continuation of corticoid therapy was considered unpromising and possibly dangerous.

Although no patient with colitis of longer than 2 years' duration experienced significant sustained improvement, 6 patients with colitis of long duration showed symptomatic benefit and are leading normal lives with continued therapy in spite of sigmoidoscopic and roentgenographic evidence of persisting disease. This fact gains importance when it is recalled that all of the patients in this study were chronically ill, unable to live normally, and unresponsive to other forms of therapy. Whether corticoids slowed the progression or decreased the complications of ulcerative colitis (hemorrhage, perforation, stricture, malignancy) in these 6 cases cannot be ascertained, but it should be emphasized that such complications may have been delayed by this form of long-term suppressive therapy. The possibility of malignant degeneration, however, should be recognized in patients who seem reasonably well as a result of treatment, but who still show evidence of active disease.

Our experience suggests that corticoid therapy cannot be expected to induce remissions in patients with colitis of long duration. The best that can be hoped for is amelioration of the symptoms and preservation of a partially functioning but still diseased bowel. In most such cases, however, colectomy will probably be required eventually.

—*Benjamin Goldman, M.D.*

Acute Colonic Obstruction in Schistosomiasis Japonica; a Clinical Study of 40 Cases—14 Associated with Carcinoma. Ch'en Ming-Chai and Ch'en Wang Shan-Chi. *Chin. M. J.*, 1957, 75: 517

Rectal and colonic lesions of schistosomiasis japonica in the late phase of the disease occasionally give rise to intestinal obstruction necessitating surgical intervention. The condition has been often mistaken for, and treated as, rectal and colonic carcinoma, and the Schistosoma origin recognized only at pathologic examination. The chronic Schistosoma colonic lesions are also at times associated with adenocarcinoma.

In the Soochow First People's Hospital, Soochow, from 1951 to 1955, the authors treated 40 patients with bowel obstruction secondary to Schistosoma hypertrophic colitis. The diagnosis in each case was proved by positive ova in the stool, by a stool hatching test, rectal biopsy, x-ray examination, and microscopic examination of the surgical specimens. Fourteen cases of this series were associated with adenocarcinoma. The 40 cases constitute 10 per cent of the 398 cases diagnosed as schistosomiasis, or 17.2 per cent of the 232 cases of chronic Schistosoma colitis treated from 1951 to 1955. This number represents 14 per cent of the 286 cases of intestinal obstruction of all kinds, or 32 per cent of the 125 cases of large bowel obstruction treated during the same period. The 14 patients who had carcinoma on pathologic examination represent 35 per cent of this series of Schistosoma colonic obstruction, or 6 per cent of all chronic Schistosoma colitis cases.

The patients were mostly between the ages of 20 and 45 years. One patient, 25 years of age, apparently contracted Schistosoma infection at the age of 8 years. Two years later he developed bowel obstruction and perforation of the intestine, which resulted in a sigmoidal fecal fistula. This was the youngest patient to

develop a Schistosoma granuloma. The oldest patient was 56 years of age. The youngest patient with schistosomiasis complicated by cancer was 23 years of age, and the average age of the 14 patients with associated cancer was 38.4 years, or 8.9 years lower than the average age of the patients with ordinary carcinoma.

The duration of Schistosoma infection is intimately related to the development of secondary obstruction as it takes many years for the infection to evolve into an obstructing lesion. Twelve patients had been infected for from one to 3 years, 11 for from 5 to 10 years, and 5 for 15 years or more. Patients having associated carcinoma usually have a long history of parasitic infection. In this series Schistosoma obstructing lesions were seen most frequently in the rectum (25 cases) and sigmoid colon (6 cases); these two groups made up 77.5 per cent of the series. The remainder were distributed in the transverse colon (4 cases), cecum (2 cases), splenic flexure (2 cases), and hepatic flexure (1 case). Such distribution corresponds to the distribution of colonic cancer during the same period. The intestinal obstruction was complete in 15 instances, in 12 of which emergency colostomy was done. The obstruction was nearly complete in 8 instances. Six of the patients in this group underwent colostomy. In the 17 other cases the intestinal obstruction was partial. After proper preparation of the bowel, primary resection could be carried out with safety in the latter group.

Intestinal perforation and fecal fistula occurred in 4 cases. Adenocarcinoma developed in 14 of the 40 cases. In 4 cases the tumors were of polypoid type, varying from 2 to 4 cm. in diameter. Grossly these lesions were in no way different from ordinary rectal or colonic cancer. Surrounding the neoplasm were many Schistosoma granules of varying sizes. There was 1 case of mucinous adenocarcinoma and another of multiple adenocarcinomas at different sites in the sigmoid colon. Three presented widespread extension and metastatic lesions in the peritoneal cavity and liver. In 2 patients the bases of the bladder and prostate glands were invaded by the Schistosoma hyperplastic changes. In one of these the condition was further complicated by a vesicosigmoid fistula. In 2 other patients, the left ureters were involved directly by the Schistosoma lesion. One patient with ileocecal schistosomiasis developed intussusception. Another developed acute appendicitis 6 months prior to resection of the sigmoid lesion. Microscopic examination of the appendix revealed deposition of Schistosoma ova in addition to the acute inflammatory process.

In this series of 40 cases, surgical treatment was carried out in 30 patients with 35 operations. The types of operation performed were colostomy (transverse, sigmoid) in 19 cases, resection and end-to-end anastomosis in 7, abdominoperineal resection in 3, Mikulicz resection in 1 case, reduction of intussusception in 1, exploratory celiotomy in 1, closure of colostomy in 1, and closure of fecal fistula in 2. Ten of 20 patients who were subjected either to colostomy or Mikulicz resection died; 4 of them were associated with cancer. Among the remaining 10 patients, one subsequently had a resection of the primary lesion, 2 had to give up their vocation, one could do only light work, 3 clearly had a poor prognosis; 1 subjected to Mikulicz resection is well after a 4 year follow-up. Two patients could not be traced. Resection of the colon or rectum was carried out on 11 patients, 5 of whom had simple Schistosoma lesions and 6 of whom had associated carcinoma. Of the 5 patients submitted to segmental resection, 2 may be considered as well since they can do full time work as farmers; 3 are doing light work. Of the 6 patients in whom resection was done for adenocarcinoma, 3 underwent abdominoperineal resection. Of these, 1 was followed for 3 years and is doing full-time work; 1, after one year and 2 months, has not been able to work because of pulmonary tuberculosis; 1, followed up for 11 months, is doing light work. Two patients of the carcinoma group who had resection and end-to-end anastomosis died, one from peritonitis and the other from cachexia and malnutrition. —*Earl O. Latimer, M.D.*

Coloscopy in the Treatment of Mucosal Polyps of the Colon. MICHAEL R. DEDDISH and RALPH E. HERTZ. *Surg. Clin. N. America*, 1957, 37: 1287.

THE FACT that adenomas and carcinomas of the colonic mucosa tend to be multiple and to coexist has become increasingly well substantiated. There is also considerable evidence pointing to the mucosal adenoma as the precursor lesion in a highly significant proportion of colonic cancers. Surgeons experienced in this field are cognizant of the limitations of palpation of the intact colon in the detection of small lesions and of soft, sessile tumors up to several centimeters in size. Meticulous barium enema roentgen studies with air contrast and high voltage techniques will demonstrate many of these tumors but cannot be depended upon to reveal all, particularly if they are less than 1 cm. in diameter. The surgeon undertaking the treatment of these lesions is therefore obligated to take further reasonable measures to deal with probable undetected neoplasms at the time of operation. It was to fill this need that the technique of colotomy and coloscopy for direct visualization of the entire colonic mucosa was devised.

Coloscopy is applicable in the search for additional mucosal lesions at the time of colotomy for a supposedly benign adenoma and when a colon resection is performed for carcinoma. In the first instance examination is effected through multiple colotomies and the technique is termed "colotomy and coloscopy." A patient should not be considered a candidate for this procedure until a polypoid neoplasm has been demonstrated in more than one barium enema x-ray examination or there is unexplained bleeding from the lower bowel. Examination of the colon mucosa at the time of resection may be through the divided bowel ends, or additional colotomies may be performed.

The first requirement for adequate safe coloscopy is a meticulously clean colon. The authors (at the Memorial Hospital in New York) allow 5 days for preparation. The diet for 3 days is of a high caloric, high protein, low residue character, and is limited to clear liquids and hard candy for the fourth and fifth days. Catharsis is by the administration of 30 c.c. of a 50 per cent magnesium sulfate solution three times a day for 4 days, and castor oil, 60 c.c., is given on the

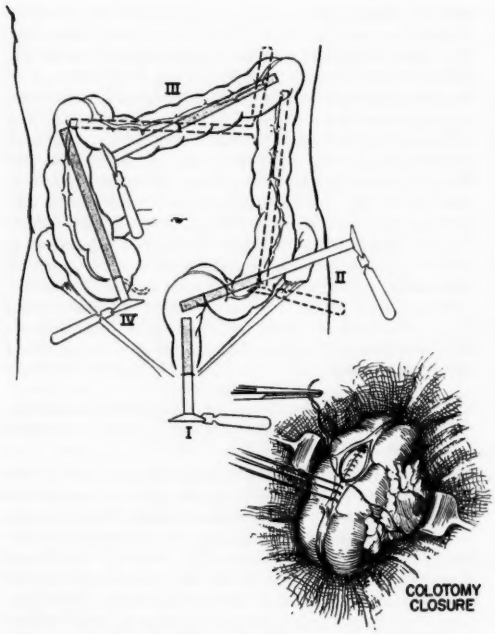

FIG. 1 (Deddish, Hertz). Technique and sequence of coloscopy.

afternoon of the fifth day. No antibiotics or sulfonamides are used routinely in the bowel preparation.

In cases planned primarily for colotomy and coloscopy, a paramedian incision centered at the level of the umbilicus is preferred. The colotomies are 2 cm. longitudinal incisions in the taenia usually placed in the sigmoid and midtransverse colon. These combined with a slight enlargement of the appendectomy cecal wound allow easy introduction of the sigmoidoscope and total visualization of the colon. A low-lying hepatic flexure frequently permits visualization of the entire right colon through a single transverse colon incision. The first incision should be placed over the known lesion, but when more than one lesion has been demonstrated it is best to place the initial incision over the most distal one. Experience has shown that the mucosa is more easily inspected in a counterclockwise order, in the respective colon segments. The colotomy incisions are closed by two layers of continuous No. 0000 chromic catgut, and interrupted sutures of No. 0000 silk in the seromuscular layer.

The authors have adopted the following measures to minimize contamination. A separate table is used for the coloscopy instruments. The wound edges are protected by impermeable drapes containing a sheet of rubber or plastic. The colotomies are carefully screened off by abdominal pads. Gloves should be changed between each colotomy. At the completion of the colotomies all superficial drapes are changed, as well as the gowns and gloves of the operating team.

Coloscopy is primarily a diagnostic technique permitting assessment of the condition of the total colonic mucosa as a foundation for rational management. The method of treatment of lesions found must be influenced by the skills, experience and judgment of the operating surgeon. It has been the practice to treat the obviously benign adenomas according to the proved principle of local excision used in the management of similar low-lying lesions per ano. One must always bear in mind the relative ease of segmental colon resection, the risk of extensive cautery snare procedures within the free peritoneal cavity, and the difficulty of later observation at the site of local excision. Well pedunculated adenomas at the site of colotomies are treated by ligation of the base and excision, while if they are at a distance from the colotomy they are removed by cautery snare technique. Small, sessile adenomas up to at least 5 mm. in size are excised by the cautery snare technique with a fine wire snare. Large sessile lesions are removed by segmental colectomy, and if suggestive of malignancy they are submitted for frozen section. If multiple adenomas are found and are considered too extensive for simple local excision hemicolectomy or subtotal colectomy with ileoproctostomy above the peritoneal reflection is done. This last procedure was carried out in only 3 patients in the group. There were other cases with diffuse polyposis in which subtotal colectomy was carried out without preliminary colotomy and coloscopy.

This study is based on the review of 147 patients who underwent coloscopy on the Rectal and Colon Service at the Memorial Center in New York during the period from 1948 to 1954. Visualization of the total intact colon was effected in 73 cases, whereas examination was incomplete in 37 instances because of poor preparation, previous resection, adhesions, or for other reasons such as extreme obesity and advanced age. There were 70 patients in the total coloscopy group on whom two barium x-ray reports were available, detailing visualized polyps. It is interesting to note that 50 per cent of these patients had additional polyps.

One hundred and five of the patients who did not have associated resection were used for a study of complications. Nine major complications occurred in 8 patients. Severe peritonitis was present in 3, with pelvic abscess formation in one. Postoperative mechanical obstruction was seen in one instance. Phlebothrombosis with pulmonary infarction occurred twice. Two unusual complications occurred. One was a small bowel perforation secondary to irrigation of the balloon of a Miller-Abbott tube with 400 c.c. of saline solution. Another patient was left with persistent saddle anesthesia following spinal anesthesia with monocaine. A low grade postoperative fever occurred in 18 patients with no associated signs or symptoms, and was considered to be the result of mild peritonitis. Protracted postoperative ileus was seen in 6 patients. The average postoperative hospital stay was 11 days with a range from 7 to 25 days.

The findings of this study are in keeping with previous observations on the tendency of colonic polyps to be multiple. Current x-ray diagnostic technique cannot be relied upon to detect all mucosal lesions,

as additional polyps were observed in 46 per cent of the cases. Forty per cent of these polyps measured more than 1 cm. in diameter. Unsuspected carcinoma at one stage or another was found in approximately 25 per cent of all patients examined after a preoperative diagnosis of benign colonic polyp. The carcinoma was not always in the preoperatively detected lesion.

It is therefore apparent that early surgical intervention is indicated once the diagnosis of a colonic polyp has been made. Colotomy and excision or segmental resection is inadequate. Total endoscopic examination of the well prepared bowel is advisable to provide a rational basis for therapy, and this can be carried out without undue morbidity. Simple coloscopy through the divided bowel ends and colotomy and coloscopy at the time of colon resection produced a 47 per cent pick-up rate of additional mucosal lesions. These examinations should be routinely carried out with resection when the condition of the patient and the preparation of the bowel permit.

—*Matthew H. Evoy, M.D.*

Familial Polyposis of the Colon; the Fate of the Retained Rectum after Colectomy in Children. T. B. HUBBARD, JR. *Am. Surgeon*, 1957, 23: 577.

THIS ARTICLE is essentially a case report of a 9 year old boy with familial polyposis of the colon. Preoperatively, Endamoeba histolytica trophozoites were demonstrated in the examinations of the stool and the patient was treated until the stool was free of parasites. In April, 1954, a subtotal colectomy was performed, preserving the distal 13 centimeters of the rectum which was studded with polyps. The polyps in the rectum were not removed. Five months later, on proctoscopic examination, there was a considerable decrease in the number of rectal polyps, and 11 months after the colectomy there were no polyps visible on proctoscopy. This spontaneous disappearance of the rectal polyps provides an interesting aspect to the case and the author discusses two possible explanations. The polyps could have been secondary to the amebic infestation and disappeared after its cure. It is conceivable that these were in reality pseudopolyps caused by the irritative effect of the parasitic infection although the author believes they were definitely true polyps and the patient was a member of a kindred affected by familial polyposis. Secondly it is proposed that perhaps some factor which stimulated the formation of polyps was removed with the greater portion of the colon. It is suggested that in children with this disease the rectum be preserved without fulgurating the polyps, then observed for some time to see if the remaining polyps will regress spontaneously.

Seventeen cases of colectomy and ileosigmoidostomy in children were collected from the literature with varying periods of follow-up (1 year to 30 years). New polyps developed in the rectal stump in 6 out of the 17, cancer developed in the rectal stump of one. On careful analysis of the collected cases, however, it will be noted that only 10 of these cases could be considered verified instances of familial polyposis coli, the other 7 had either a questionable or negative familial history. Of the 10 definite cases new polyps developed in the rectal stump in 5, carcinoma developed in the rectal stump in 1 and, "no new polyps were mentioned" in 1. The remaining 3 had been followed up for only 1 year, 2.5 years, and 3 years respectively. One would not expect to see this spontaneous regression of rectal polyps very often in definitely established cases of familial polyposis coli in view of present wide experience to the contrary. The author's case had been followed up for 29 months postoperatively at the time of writing.

—*Bernard C. Gerber, M.D.*

Elective Resection for Sigmoidal Diverticulitis. GEORGE STRENGER. *Am. J. Surg.*, 1957, 94: 577.

A REVIEW of the author's patients shows that 23 per cent had symptoms of sigmoidal diverticulitis for more than 5 years, and that 30 (46 per cent) were more than 70 years of age. It is evident that this is an inflammatory disease which tends to become chronic and to increase in severity during the course of the years. The advanced complications which result from it are such as to make late surgical treatment both difficult and hazardous, as the only definitive procedure is resection of the diseased segment of colon. On the other hand, resection of a sigmoid colon involved by diverticulitis in its early phases carries with it a low morbidity and mortality. It is, therefore, obvious that elective resection in early cases is the preferable mode of treatment.

In order to select the patients suitable for early operation it is suggested that the following criteria be used. The patient should give a definite history of the disease supported by specific physical signs in the lower quadrant of the abdomen. In addition, roentgen study should show not only diverticula but also the persistent spasm and deformity of the sigmoid indicative of an inflammatory process. The patient should also give the specific history of more than one attack. Rectal bleeding is an additional and important indication for early operation.

The patient's general condition must be such as to allow the performance of major resection of the bowel. This is especially important in individuals past the age of 70 who may have general arteriosclerotic disease and/or evidence of electrolyte and protein depletion. If such deficiencies can be decreased or corrected, primary resection on an elective basis should be considered even in elderly patients.

—*Benjamin Goldman, M.D.*

Acute Intraperitoneal Perforations of the Colon and Rectum. ALASTAIR A. MURRAY. *Canad. M. Ass. J.*, 1957, 77: 336.

THERE is still a high mortality from acute intraperitoneal perforation of the colon and rectum. The most common causes of such perforation are diverticulitis and carcinoma. Recently, the number of perforations from ulcerative colitis has increased because of treatment with cortisone; dysentery and trauma account for most of the other perforations.

The author points out that proximal colostomy is usually necessary in addition to any attempt to suture the perforation. He recommends drainage in many cases but not, of course, as an isolated procedure. Exteriorization is very frequently made impossible by the

pathologic process. Resection is, similarly, often too extensive a procedure in the acute stage. The author favors staged procedures in most cases of perforation due to diverticulitis. In carcinoma, the decision whether to do primary resection or not, depends upon the patient's condition and the location of the lesion. In ulcerative colitis, immediate colectomy and ileostomy is the preferred treatment. In cases due to trauma, repair of the injury with proximal decompression is the treatment of choice.

Twelve cases of perforation of the distal colon due to diverticulitis are reported, all treated by proximal colostomy and drainage. Four perforated carcinomas of the colon were treated, one by right hemicolectomy in one stage, two transverse colon lesions by obstructive resection, and the last one by left hemicolectomy in three stages. Three traumatic perforations were treated by proximal colostomy and drainage. All 19 patients survived. —*H. C. Grillo, M.D.*

The Treatment of Complete Prolapse of the Rectum. E. S. R. Hughes, L. W. Gleadell, and John Turner. *Brit. M. J.*, 1957, 2: 179.

The conflicting reports on the results of treatment of complete prolapse of the rectum have caused confusion, and this is reflected in the large number of operations which have been advocated for the condition. The authors describe the two types of operation which they have performed since 1951 and record the progress in the results.

In complete prolapse of the rectum there is a peritoneal sac extending distally between the vagina (or prostate) anteriorly and rectum posteriorly. As such a peritoneal sac may be present without rectal prolapse it is probable that the latter appears only when the pelvic fascia and the muscles surrounding the pelvic aperture are defective.

A series of 30 patients suffering from complete prolapse of the rectum was subjected to operation. They were divided into two groups according to the operation performed.

In group 1, comprising 17 patients, a synchronous combined abdominoperineal repair was performed. A perineorrhaphy was carried out after complete excision of the peritoneal sac from above. The pelvic cavity was then obliterated with encircling sutures of silk. In this group 3 patients suffered a recurrence, but in the remainder the result remained satisfactory for periods up to 5.5 years.

In group 2 in which there were 13 patients, a synchronous combined abdominoperineal repair was performed. Perineorrhaphy was carried out after complete excision of the peritoneal sac. The pelvic fascia between the rectum and the vagina (or prostate) was sutured with a series of interrupted silk sutures after which the remaining pelvic peritoneum was obliterated as in group 1. No recurrences have yet occurred but the longest follow-up is only 13 months.

Many operations which have been designed for complete prolapse of the rectum have entailed excision of the rectum and sigmoid colon. The procedures used by the authors have consisted of removal of the hernial sac and repair of the defect without removal of the bowel. The repair has been designed to correct an anatomical defect and does not rely on fixation of the bowel or suspension from neighboring rigid structures. —*Harold L. Method, M.D.*

LIVER, GALLBLADDER, PANCREAS, AND SPLEEN

Liver Disease of the Chronic Alcoholic Simulating Extrahepatic Biliary Obstruction. Gerald B. Phillips and Charles S. Davidson. *Gastroenterology*, 1957, 33: 236.

The active liver disease of the chronic alcoholic, when uncomplicated, usually improves rapidly, in the authors' experience, following hospitalization and consumption of an adequate diet, and is usually differentiated from extrahepatic biliary obstruction. At times, however, prolonged jaundice occurs and a diagnosis of extrahepatic biliary obstruction is considered, especially when a history of alcoholism is not elicited. Such prolonged jaundice in the alcoholic is usually associated with pronounced characteristic alterations in hepatic histology.

Acute liver disease of the chronic alcoholic can simulate extrahepatic biliary obstruction as was shown by the 4 case histories presented. Two of the patients, in fact, had exploratory laparotomies, while the other 2 were spared operation by hepatic biopsy. Severe and prolonged jaundice in the chronic alcoholic with liver disease is by no means rare. Moreover, it is usually associated with severe liver disease and may progress despite the withdrawal of alcohol, the administration of a nutritious diet, and bed rest. All of the patients passed light-colored stools, but in none of them, however, was biliary obstruction complete, as all of them showed the presence of urinary urobilinogen. Several of the laboratory tests suggested extrahepatic biliary obstruction. Two of the patients had an increase in the serum alkaline phosphatase concentration. One patient had normal cephalin-cholesterol flocculation reactions, while another had a negative reaction and the icterus index increased. In one patient the prothrombin concentration increased during the intravenous administration of vitamin K.

Suggestive of primary liver disease in these patients were the initial elevation in urinary urobilinogen concentration in 2, the positive cephalin-cholesterol flocculation reaction in 1, and the marked leucocytosis, predominantly of polymorphonuclear leucocytes, in 2, the latter findings being frequently observed in the chronic alcoholic with acute hepatic insufficiency.

Clinical evidence of severe liver disease was present in 3 of the patients and included ascites and edema, prominent superficial abdominal veins, fetor hepaticus, splenomegaly, and spider telangiectasia.

The difficulty of diagnosis was increased in the 3 female patients by the failure to elicit a history of chronic alcoholism. As the liver disease of the chronic alcoholic with prolonged jaundice is usually severe, laparotomy in these patients may be hazardous. On the other hand, unrelieved extrahepatic biliary obstruction may lead to fatal termination, often with progressive liver disease. Thus, differentiation between these two conditions is imperative. In most

cases, careful clinical observation will accomplish this objective. Occasionally, however, the diagnosis of primary liver disease in the jaundiced chronic alcoholic will be more elusive. In this situation, the hepatic biopsy should provide a dependable means of identification. —*Harold L. Method, M.D.*

Prolonged Jaundice (Over 3 Months) Occurring During Chlorpromazine Administration. IRVING B. BRICK and STEPHEN V. BUCKLEY. *Gastroenterology*, 1957, 33: 192.

THE OBVIOUS INTEREST in the occurrence of jaundice during treatment with chlorpromazine is indicated by the large number of articles, usually reporting various aspects of specific cases, which have appeared in a short period of time. Only a few articles appeared in the latter part of 1954, but many articles on this subject were written in 1955 and the first half of 1956.

Using only those reports having sufficient data for the purposes of this article, the authors have collected from the literature 113 cases of this variety of jaundice which, in addition to their 7, make a total of 120 cases. Including the 3 cases of protracted jaundice reported in this article, there have been a total of 12 cases in which the jaundice lasted over 3 months. Thus, in 10 per cent of all the cases compiled the jaundice was of long duration. It is the purpose of this report to emphasize that this type of jaundice may be present for months. The importance of the recognition of this fact is emphasized by the nature of the chemical findings in the typical case simulating obstructive or surgical jaundice. Possibly even more significant is the frequency of surgical exploration in the cases reported. In 21 of the 120 cases (17.5 per cent) surgical exploration of the extrahepatic biliary structures was performed with negative results. A decrease in the number of these unnecessary operations should be possible with more widespread recognition of the varied clinical features of this entity.

Aside from the prolonged course and deeper jaundice, the cases here reported are essentially no different in their characteristics than the more frequently seen cases of short duration. Most important is the history of the ingestion of chlorpromazine. Eosinophilia, best measured by total eosinophile counts rather than by differential evaluation of the cells in the blood smear, is noted in more than half of the cases. It may be present early or late, and apparently in some cases it may be a transient finding. The typical laboratory data of negative or slightly abnormal flocculation tests, even after months of jaundice, and elevated serum alkaline phosphatase levels are present in the cases of long duration. In the authors' cases, elevations of alkaline phosphatase have persisted even when the serum bilirubin has become normal.

In 2 of the cases reported, liver biopsy performed 7 and 12 weeks, respectively, after the onset of jaundice, revealed histologic findings similar to those reported by Zatuchni and Miller, Lindsay and Skahen, Gambescia *et al.*, and other authors. Prominent is the bile stasis or thrombi, especially in the central biliary canaliculi, but part of the findings includes small areas of focal necrosis and portal infiltration by histiocytes and eosinophils. Thus, the lesion is not purely one of intrahepatic bile stasis, but also a pericholangitis with greater or lesser degrees of parenchymal cellular infiltration. The definite history of chlorpromazine administration and the biopsy findings mentioned would represent, in the authors' opinion, strong recommendations to avoid surgery until there is more definite evidence of extrahepatic obstructive jaundice. —*Harold L. Method, M.D.*

Anatomy and Surgical Technique for Resection of the Left Lobe of the Liver and Segments of the Left Lobe of the Liver (Anatomia e tecnica chirurgica dell' exeresi tipica lobare e segmentaria del settore sinistro del fegato). M. MANCUSO, E. NATALINI, and G. DEL GRANDE. *Policlinico, sez. chir.*, 1957, 64: 127.

THIS WORK is an excellent study of the vascular anatomy of the liver with angiographic studies of the portal circulation and dissection diagrams of the hepatic vein system. With this knowledge, the authors have described a surgical technique for resection of the left lobe of the liver with preservation of the portal vein, hepatic artery, and hepatic vein circulation.

As shown by Couinaud, the portal vein divides the liver into an anterior and posterior division. From this main division, branches are given off to the various lobes of the liver, dividing it into six lobes. Dissection studies have shown that the hepatic vein in the hilus of Glisson's capsule also has a segmentary distribution to the six lobes of the liver. The surgical technique described here depends on the identification of the segmentary distribution of these two systems.

The surgical procedure is done through a thoracoabdominal exposure. The left lobe of the liver is freed from its ligamentous attachments. The suspensory ligament is then severed and the diaphragm is divided to the coronary ligament. The connective tissue is separated by blunt dissection and the hepatic vein is identified. Further dissection is carried out to identify the main tributaries to the left lobe of the liver. The portal vein is then followed to the hilus and the right and left divisions are identified. At the same time the hepatic artery is also dissected. The main tributaries to the left lobe of the liver are separated. The left lobe of the liver is then resected along the sagittal ligament, and the hepatic and portal veins and the hepatic arteries are severed and ligated as they are approached down to the main division from the previously exposed trunk. The authors describe similar techniques for removal of segments of the left lobe of the liver in detail.

—*Roland A. Manfredi, M.D.*

Gallstones: Solubility Studies. ROBERT G. LUTTON and ALFRED M. LARGE. *Surgery*, 1957, 42: 488.

THE AUTHORS studied the solubility of gallstones in experimental animals and in vitro at the Department of Surgery, Wayne State University College of Medicine. These studies were based on an observation made by Harley and Barratt in 1903 that gallstones were gradually disappearing when placed in the gallbladder of the living dog. The authors then studied mixed human cholesterol-pigment stones obtained by cholecystectomy and arranged in groups so that simul-

taneous studies could be carried out on stones of almost the same composition.

The animal experiments were carried out by introducing a single human stone into the gallbladder of dogs, pigs, sheep, and goats. This was done under ordinary aseptic conditions and the animal was reoperated upon at various intervals after instillation and the stones were removed and weighed. In vitro experiments were carried out by use of an intricate device of which the authors show an illustration in their article. This device basically allowed the continuous flow of bile over gallstones suspended in a graduated tube. Care was taken to be sure that fragmentation or absorption of water was not the factor contributing to the changes in weight. In vitro and in vivo studies were carried out for periods of time up to about 3 weeks.

In the animal experiments it was evident that stones lost weight when they were placed in the gallbladder in any of the animals used, although there was considerable variation in the amount of weight loss. The average daily weight loss was 1.7 per cent of the stone and this weight loss was highest in stones placed in dogs' gallbladders. In vitro studies showed an average daily weight loss of from 0.06 mgm. in the cholesterol-supplemented dog hepatic bile to 4.28 mgm. in dog gallbladder bile; the daily weight losses in dog hepatic bile and in human hepatic bile were intermediate between these two extremes.

It was evident then that some factor in the dog gallbladder bile helped in the loss of weight of the stones since the same factor was not present in dog hepatic bile. When cholesterol was added to the system the loss of weight was minimal. Thus, a low cholesterol content in the bile was essential to continued loss of weight.

The authors believe it is reasonable to assume that factors which are intimately related to the solubility of gallstones may also play an important part in their formation. The solubility or lack of solubility of stones may possibly be on the basis of the phospholipid content of the bile in the gallbladder, and this may play a part in the increased solubility factor of dog gallbladder bile. —*Peter Dineen, M.D.*

Annular Pancreas. THOMAS J. WHELAN, JR. and GEORGE B. HAMILTON. *Ann. Surg.*, 1957, 146: 252.

THE AUTHORS present 3 cases of annular pancreas which increases the total number of surgically treated cases reported to 93.

Two main theories have been advanced to explain the origin of annular pancreas. The failure of the ventral anlage of the pancreas to rotate with the duodenum during fetal development is suggested as one cause. A second theory considers this phenomenon to be the result of pancreatic hypertrophy anterior and posterior to the descending portion of the duodenum.

The annular segment is made up of normal pancreatic tissue, and neoplasms have not been reported to originate from this site to date.

Of particular interest is the high incidence of duodenal stenosis and atresia ssociated with this disease. The authors suggest that coexistence of duodenal stenosis with an annular pancreas probably results from rotation of the duodenum and ventral pancreatic anlage at the same time the lumen of the gut is evolving from the solid state in the 6 to 7 week old embryo. In 70 per cent of children and 14 per cent of adults other anomalies are found to be associated with annular pancreas.

Four major complications occur as a result of this anomaly: (1) duodenal obstruction, (2) peptic ulceration of the duodenum or stomach, (3) pancreatitis, either acute or chronic, and (4) obstruction of the biliary tract.

Two distinct clinical pictures are possible—acute high grade duodenal obstruction and chronic low grade duodenal obstruction. The former is most common in infants and is characterized by feeding problems beginning at birth with dehydration, alkalosis, and weight loss. Vomitus may or may not contain bile. These children are desperately ill and require adequate fluid and electrolyte replacement prior to operation. Roentgenograms usually reveal a greatly dilated stomach and duodenum. In adults the pattern is usually one of chronic duodenal obstruction. Symptoms include postprandial fullness, belching, and intermittent vomiting. At any time in the course of this disease the patient may develop a peptic ulcer or an acute pancreatitis which may transform the chronic picture into an acute clinical situation. Bleeding from an ulcer is not an uncommon complication. Here again roentgenograms reveal a dilated first portion of the duodenum and a narrowed second portion of variable length. There is no distortion of mucosal markings in the area of narrowing. When ulceration has occurred in the duodenal bulb there may not be the characteristic dilatation which is usually associated with this disease. Differential diagnosis includes extrinsic compression from a duodenocolic membrane, congenital duodenal bands, neoplasms, cicatrizing duodenitis, or postbulbar ulcer with stricture.

Three main categories of treatment have been advised: (1) resection or division of the pancreatic annulus, (2) bypass procedures, and (3) gastric resection. Resection of the pancreatic annulus often is followed by the development of a fistula and often a stenosis of the duodenum remains which is not corrected. The procedure which will relieve obstructive symptoms and is attended by the smallest number of complications is the side-to-side isoperistaltic duodenojejunostomy. Gastrojejunostomy has the disadvantage of not adequately decompressing the dilated duodenal bulb and producing a situation conducive to the development of a marginal ulcer. Gastrectomy has been performed for the most part when a peptic ulcer is present. It is the authors' opinion that the annulus should not be divided when gastrectomy is performed. There have been no instances of duodenal stump leakage following closure of the dilated proximal duodenum.

In those cases with recurrent pancreatitis the authors believe that duodenojejunostomy should be performed first. Sphincterotomy might be considered, however this has not been reported as a method of treatment to date. When jaundice is associated with pancreatitis, decompression of the common bile duct in conjunction with duodenojejunostomy is the recommended procedure.

—*M. C. Anderson, M.D.*

Discussion on Chronic Relapsing Pancreatitis. HENRY DOUBILET. *Proc. R. Soc. M.*, Lond., 1957, 50: 629.

THE AUTHOR presents his extensive experience with 500 cases of pancreatitis in this excellent review. The gallbladder, biliary tract, and pancreas comprise a physiological unit and disease of one of these structures affects the remainder. A common passageway exists in all cases of recurrent pancreatitis. When the sphincter of Oddi, which is the key to the etiology of disease of the pancreatic-biliary system, becomes spastic, a portion of the bile may be diverted into the pancreatic duct. Increase in sphincter tonus (or spasm) is produced primarily by frustrating emotions, exhaustion, or by pain occurring elsewhere. The entrance, under tension, of a concentrated solution of bile salts into the pancreatic duct produces an acute inflammation varying in degree from mild edema to fulminating hemorrhagic necrotizing pancreatitis.

Once pancreatitis is established, a normal gallbladder with its great ability to concentrate bile becomes a liability and should be removed. A diseased gallbladder may produce reflex spasm of the sphincter due to pain and likewise should be removed. The maximum pressure of bile secretion by the liver is 300 to 400 ml. of water. The force of contraction of the gallbladder is approximately 250 ml. of water. The secretory pressure of the pancreas is also between 300 and 400 ml. of water. Since the liver secretes continuously and the pancreas does so only in response to food, it is possible for bile to enter the pancreatic duct when the sphincter is in spasm. The duct epithelium of the pancreas, in the presence of acute inflammation, becomes permeable and permits extravasation of enzymes into surrounding tissues even when the duct itself is grossly intact. This can be shown by using radiopaque substances which, when the duct is inflamed, will permeate into the pancreas and render it opaque. With resolution of the inflammation, this opacity no longer occurs. Sphincterotomy, by lowering the pancreatic intraductal pressure, reduces duct permeability and helps to resolve inflammation.

The pain of pancreatitis is due to two causes; (1) distention of the bile and pancreatic duct behind a spastic sphincter, and (2) the acute chemical inflammation resulting from bile reflux into the pancreatic duct involving the parietal peritoneum and the retroperitoneal tissues. Sphincterotomy will abolish both of these.

There is no evidence that obstruction of the pancreatic duct plays a part in the origin of pancreatitis. Increased intraductal pressure, as a result of sphincter spasm, will divert pancreatic juice during a phase of pancreatic necrosis into the retroperitoneal space and pseudocysts may rapidly result. If a pseudocyst is simply drained, a chronic cutaneopancreatic fistula will result. Sphincterotomy results in cure of the pseudocyst and rapid closure of the fistula. The treatment of cysts and fistulas of the pancreas by sphincterotomy requires the presence of an unobstructed pancreatic duct. If an operative pancreatogram shows partial obstruction by stone or stricture, either the obstruction is removed or a caudal pancreaticojejunostomy is performed. Because of the anatomical relationship of the sphincter to the duodenal wall, section of the sphincter for a distance of only 8 to 10 mm. does not produce duodenal reflux and the sphincter heals in a position of retraction. A diseased pancreas, with or without sphincterotomy, will react to ingested fats and alcohol by producing a severe attack. However, when the pancreas has regenerated 6 to 18 months after sphincterotomy, as proved by secretin tests, fats and alcohol do not produce this untoward effect. Thus, sphincterotomy is but the first step in the treatment of recurrent pancreatitis.

—*Sheldon Oscar Burman, M.D.*

Fatal Postoperative Pancreatitis. DEWARD O. FERRIS, THOMAS E. LYNN, JAMES C. CAIN, and ARCHIE H. BAGGENSTOSS. *Ann. Surg.*, 1957, 146: 263.

THE AUTHORS review 9 cases of fatal postoperative pancreatitis which occurred at the Mayo Clinic from 1940 through 1955. The basic pathologic process in the production of acute pancreatitis is the presence of necrotizing pancreatic enzymes in contact with the tissues of the pancreas. Increased pressure within the pancreatic ductal system is an important etiologic factor and may be produced in a variety of ways, including obstruction of Wirsung's duct by inflammation, edema, stone in the common duct, or spasm of the sphincter of Oddi. Spasm of the sphincter of Oddi may follow the use of morphine, methadone, dromoran, and demerol. Also the pancreatic ducts may be occluded within the substance of the pancreas by pancreatic calculi, epithelial metaplasia, or thick pancreatic secretions. Other factors which may be of etiologic significance are increased viscosity of pancreatic secretions and pancreatic ischemia resulting from injury to the pancreatic blood supply. In postoperative pancreatitis, direct trauma to the gland also may be of importance.

The following operative procedures were carried out in the 9 cases reported:

1. Exploration for suspected carcinoma of the pancreas in which cholecystoduodenostomy was performed to relieve jaundice, and a pancreatic biopsy was obtained.

2. Operations on the biliary tract were performed in 3 patients. These included a common duct exploration with a transduodenal sphincterotomy, a common duct exploration and a transduodenal sphincterotomy with the insertion of a long-limbed T-tube which extended into the duodenum, and a cholecystostomy in a patient in whom stones were known to remain in the common bile duct at the time of operation elsewhere.

3. A gastric operation for marginal ulcer in which resection and vagotomy were performed and gastrointestinal continuity re-established by means of a posterior Polya's anastomosis using the Hofmeister modification.

4. Operations distant from the pancreas included a transurethral fulguration of recurrent papillary epitheliomas of the bladder, and 3 transurethral resections for benign prostatic hypertrophy.

The clinical manifestations of postoperative pancreatitis generally appear within the first few days following surgery. In this series all patients had symptoms by the third postoperative day. Abdominal pain associated with a marked fall in blood pressure heralded the onset of pancreatitis in 5 cases. The initial

feature in the other cases was pain alone in 1, shock in 2, and oliguria in 1. The pain was severe and located either in the epigastrium and midabdomen or in the lower part of the abdomen. Hypotension was marked and associated with hemoglobin and hematocrit levels within normal limits. This shock characteristically responded poorly to conventional methods of treatment. Severe oliguria associated with hypotension was accompanied by azotemia, hypochloremia, and acidosis. Hypocalcemia was found in each of 4 patients tested. Necrosis of the renal tubular epithelium was observed in 7 cases.

No common etiologic factor was present in these patients and it would seem that a combination of mechanisms was responsible. Factors of possible significance included obstruction to pancreatic drainage, direct manipulation, and surgical trauma to the pancreas. Each of 4 patients undergoing transurethral surgery was more than 70 years of age. The authors suggest that sludging of pancreatic secretions by medication, anesthesia, and dehydration may have been significant. The release of proteolytic enzymes during prostatic surgery could be important.

Once pancreatitis is suspected, management should include nasogastric suction, cautious control of fluid and electrolyte balance, broad spectrum antibiotics, vagal blocking agents, and the avoidance of morphine and allied agents. —*M. C. Anderson, M.D.*

The Effect of Ligature of the Inferior Vena Cava on Experimental Intestinal Infarction (Sugli effetti della legatura della vena cava inferiore nell'infarto intestinale sperimentale). S. Visconti and L. Pellegrini, *Gior. ital. chir.*, 1957, 13: 387.

The authors studied the role of venous reflux in the pathogenesis of mesenteric infarction. Mesenteric infarction was produced in dogs by ligating the superior mesenteric artery. When simultaneous ligature of the inferior vena cava was done in a second group there was a profound modification in the gross and histological picture of infarction. The bowel was never found to be black and gangrenous at autopsy but, instead, appeared ischemic and pale in color. Histologically there was edema with superficial necrosis of the mucosa but no bloody extravasation was seen. There was no change in mortality or prolongation of life in the second group. The deaths in the second group are believed to result from vasomotor reflex mechanisms. —*George L. Nardi, M.D.*

MISCELLANEOUS

Significance of Regional or Reflex Ileus in the Roentgen Diagnosis of Cholecystitis, Perforated Ulcer, Pancreatitis, and Appendiceal Abscess, as Determined by Survey Examination of the Acute Abdomen. Barton R. Young. *Am. J. Roentg.*, 1957, 78: 581.

Regional or reflex ileus is frequently demonstrated in the neighborhood of an acute inflammatory process in the abdomen by survey roentgen examination. Location of the ileus suggests the site of involvement and, in the right upper quadrant, gas-distended bowel often aids in the diagnosis and visualization of an acutely enlarged gallbladder. Fixation of one or two distended loops is additional indirect evidence of neighborhood inflammatory disease and, therefore, a valuable roentgen sign. It is determined by noting absence of appreciable movement on supine, prone, and horizontal beam lateral decubitus roentgenograms. These views are basic requirements and should be supplemented by additional ones as conditions indicate.

In this study the significance of reflex ileus in the diagnosis of acute cholecystitis, perforated ulcer, pancreatitis, appendiceal abscess, and other plain film manifestations of these diseases are discussed and illustrated. —*W. Foster Montgomery, M.D.*

GYNECOLOGY

UTERUS

Follow-Up on Cervical Epithelial Abnormalities. BEN PECKHAM and R. R. GREENE. *Am. J. Obst.*, 1957, 74: 804.

THE CONCEPT of preinvasive squamous cell carcinoma of the cervix has become firmly established in recent years although the criteria for the diagnosis of this lesion vary somewhat from person to person and place to place. The widespread interest in this lesion plus the increased use of vaginal and cervical smears as a screening procedure have made it evident that there is a whole spectrum of lesser abnormalities which lie in the continuum between normal epithelium and preinvasive carcinoma. It has been suggested that these changes may represent steps in a progression from the normal to preinvasive carcinoma.

In an attempt to assess the significance of such lesions the biopsy specimens from 489 patients were reviewed. Over half of these patients were between the age of 20 and 35 years. Of these 489 patients found to have epithelial abnormalities insufficient for the diagnosis of preinvasive carcinoma, 242 had one to 13 follow-up biopsies, for the most part of the four-quadrant type. A small number had hysterectomy or cone amputation of the cervix. Of these, 133 were given an initial diagnosis of atypical basal-cell hyperplasia and 109 were considered to have equivocal lesions. In 40.5 per cent of these patients the lesion could not be found at the last tissue examination. In 48.8 per cent abnormalities persisted and in 10.7 per cent preinvasive carcinoma (there was only one invasive carcinoma) was ultimately found. Twelve, or 5.0 per cent, at some time during follow-up had a tissue diagnosis of preinvasive carcinoma that was not found on subsequent tissue examination.

Sixty-nine of the 242 patients with follow-up were pregnant at the time of the original diagnosis and 173 were not. The disappearance rate was 34.8 per cent in the pregnant women and 42.8 per cent in those who were not. The persistence rate was 53.6 per cent in the pregnant group and 46.8 per cent in the nonpregnant. Carcinoma was present in the last biopsy in 11.6 per cent of the pregnant group and 10.4 per cent of the nonpregnant group. —*Ely Elliott Lazarus, M.D.*

Early Diagnosis and Treatment in a Cancer Survey Program; a Preliminary Report. JOHN C. ULLERY, EMMERICH VON HAM, and EDWARD MILLER. *Obst. Gyn.*, 1957, 10: 371.

A COMBINED EFFORT by the National Institutes of Health, the Columbus Academy of Medicine, and the Departments of Pathology and of Obstetrics and Gynecology of Ohio State University has resulted in the initiation of an extensive survey of pelvic cancer employing exfoliative cytologic technique in Columbus and Franklin County, Ohio.

The study was set up to be precisely comparable to that begun in Memphis, Tennessee. This is a preliminary report of one year's experience, from May 1, 1956 through May 1, 1957. During this period 37,540 slides from 35,394 women were screened. Either vaginal aspirations or cervical scrapings were obtained and often both.

There were 99 carcinomas thus detected of which 68 were entirely unsuspected clinically. This gives an incidence rate of 0.279 per cent in Columbus compared with a previously reported incidence rate of 0.75 per cent in the Memphis study. The discrepancy is not readily accounted for.

Interestingly, among the 99 there were 18 instances in which malignant cells on the slides were initially overlooked and only recognized in retrospect. However, almost all such oversights occurred in the first 6 months of the study and were fewer in number as the cytologists gained experience. There were also 4 adenocarcinomas.

Comparing slides obtained by simple aspiration with those obtained by cervical scraping, there were 11 patients with cancer whose aspiration examination yielded no malignant cells but whose scrapings did yield malignant cells. Six of these were in situ and 5 were invasive.

Of the 99 cancers, 12 were of the corpus, 3 of the vagina, and 1 of the ovary with uterine and tubal extension.

The need for such screening to obtain lesions in earlier stages when they are more amenable to therapy is emphasized by the authors.

—*Everett Shocket, M.D.*

Preclinical Carcinoma of the Cervix. J. P. A. LATOUR, L. B. BROWN, and L. A. TURNBULL. *Am. J. Obst.*, 1957, 74: 354.

THE CLINICALLY UNSUSPECTED but biopsy-proved invasive (minimally) carcinoma of the cervix is being seen more and more often. It constitutes neither a true stage 0 nor a true stage 1. At the Royal Victoria Hospital, Montreal, Quebec, the patients are specially identified and classified in the hospital records as between stage 0 and stage 1.

Currently at the Royal Victoria Hospital 8,000 cervical smears are being scrutinized annually. Approximately 60 carcinomas are detected each year, but of these fully one-half are not clinically detectable. Between 1947 and 1955 there were 154 such preclinical cancers of which 97 were found to be "early invasive" upon step-sectioning of serial blocks of the biopsy material. Fifty-seven were designated as "in situ." All were from clinically negative cervices that had yielded an alerting cytology on smear.

The median age of the patients with stage 0 carcinomas was 34.0 years, for those with stage 1 it was 48.0 years, and for the "early invasive" clinically negative group the median age was 35.7 years. If the modal statistic is employed it was 30 to 34 years for the stage 0 group, 35 to 39 years for the "early invasive" clinically negative group, and 50 to 54 years for the stage 1 group. This suggests, the authors state, that there is a prolonged time interval between a preclini-

cal and a clinical cervical cancer. This is one of the key factors that has encouraged the authors to observe, without any treatment, some of these preclinical cancers in young women who are desirous of subsequent pregnancies. Any woman so followed up has had semiannual cytological examinations.

Of 97 patients with "early invasive" clinically negative cervices, 96 are known to be alive without recurrence for 6 months to 9 years after the diagnosis. Only 3 have been observed (after ring biopsy) without treatment. The other 94 have been managed by various methods. Twenty-eight had radium only; 16 had hysterectomy only; 11 had hysterectomy with bilateral salpingo-oophorectomy; 12 had half-standard radium followed by hysterectomy with bilateral salpingo-oophorectomy, and the remainder were managed by sundry modifications. The one death was from luetic heart disease and occurred in a treated patient.

Of the 57 patients with in situ carcinoma, all are alive without recurrence. Seventeen of this group have been merely observed without treatment and all but one have remained cytologically negative. (Cytology reverted after ring biopsy.) The one exception is a 77 year old patient who had a recurrence of the positive cytology 3 years after the ring biopsy.

From this experience the McGill group advocates a conservative approach to carcinoma in situ in young women who are anxious for further pregnancies and who are agreeable to continual cytological follow-up. They are not yet in position to recommend such conservatism, however, in the "early invasive" clinically negative cancer, but are willing to consider it in exceptional cases. In age incidence and in response to treatment this latter group is closer to stage 0 than to stage 1. If included in stage 1 it constitutes half the group at the Royal Victoria Hospital, and the easy curability yields a false sense of achievement in the over-all cure rate of stage 1 lesions. Accordingly, the authors urge creation of a new designation or subdivision for this unique intermediate lesion.

—*Everett Shocket, M.D.*

Therapy of Carcinoma in Situ. Richard W. Te Linde, Gerald A. Galvin, and Howard W. Jones, Jr. *Am. J. Obst.*, 1957, 74: 792.

Studies made by the authors suggest that in the majority of cases invasive cervical cancer is preceded by carcinoma in situ or atypical changes in the cervical epithelium. These studies suggest further that in the majority of cases carcinoma in situ is preceded by atypical changes in the epithelium which the authors call basal-cell hyperactivity. However, the authors believe that only a small percentage of these cases progress to carcinoma in situ which may then advance to invasive cancer.

Influenced by these findings the authors conclude that the presence of carcinoma in situ is an indication for prompt definitive therapy. However, the relatively small percentage of cases with basal-cell hyperactivity which progress to more serious lesions has led them to a very conservative attitude in dealing with these lesions clinically. In these cases biopsy and rebiopsy for as long as necessary, together with cold conization in selected cases, are greatly preferable to precipitant definitive surgery which will often prove to be unnecessary. The definitive treatment for carcinoma in situ is hysterectomy. When the diagnosis is made during pregnancy the patient is usually allowed to complete the pregnancy.

It is the responsibility of the gynecologist to have uteri which have been removed for carcinoma in situ thoroughly studied histologically. When fairly extensive invasion of the cervix or myometrium is found, a course of deep x-ray therapy should follow hysterectomy. When, at operation, extension beyond the confines of the uterus is encountered, the surgeon has the choice of changing his operative procedure to a more radical hysterectomy with complete lymphadenectomy or of closing the abdomen and treating the patient with a full course of irradiation. In carrying out the routine total hysterectomy for carcinoma in situ, the importance of a generous vaginal cuff should be emphasized, for even when the lesion is limited to the surface it may be quite extensive.

—*Ely Elliott Lazarus, M.D.*

ADNEXAL AND PERIUTERINE CONDITIONS

Random Inguinal Node Biopsy and Peritoneal Fluid Study in Ovarian Cancer. Robert E. Cassidy, David P. Hansford, and R. Jocelyn Crawley. *Am. J. Obst.*, 1957, 74: 616.

Twenty-eight patients suspected of having ovarian cancer were subjected to random inguinal node biopsy, peritoneal fluid cell block study, or both.

Node metastases were positive in 9 of 16 patients. Cell block studies were positive in 12 of 22 patients. Both studies were done on 13 patients and 10 had positive nodes, positive fluid, or both.

The authors believe that if similar results would be obtained in a large series of cases, it would be possible to use preoperative deep x-ray therapy in an attempt to perform more definitive surgery, and thereby improve the over-all cure rates for treatment of ovarian cancer.

—*M. Leon Tancer, M.D.*

Surgery in Tubal Obstruction (Cirurgia das obstruções tubárias). Clarice do Amaral Ferreira. *Rev. brasil. cirurg.*, 1957, 33: 97.

Twenty-three patients were operated upon for sterility. Only those patients were recommended for surgery who were still in the child-bearing period, preferably under 30 years of age, those in whom closure of the tubes was proved, and in whom the tubal occlusion was apparently the sole cause of sterility. Those in whom the tubal occlusion did not yield to physicochemical methods of treatment were also selected for operation as well as those in whom a previous bilateral salpingectomy or tubal ligation had been performed. Appropriate methods were used to test the fertility of the husband.

Of the 23 surgically treated patients, 6 were subjected to a simple salpingostomy, 10 to a salpingo-uterine reimplantation, and 7 to an ovariouterine implantation. Postoperative insufflation with CO_2 gas was carried out in all except 1 of these subjects.

In the group in which salpingostomy was performed, the tubes remained open for from 2 to 10 months; however, no living children resulted from the operations performed.

In all 10 of the group with salpingouterine reimplantation restoration of tubouterine permeability was secured, but after 2 months it was present in only 6. Of the 6 patients, 2 became pregnant; one pregnancy occurred 4 months after the operation, the other 18 months after tubal patency had been re-established. Both pregnancies resulted in living children.

In the group in which an ovary, or portion of an ovary, was implanted into the uterine cavity, a living child resulted in 1 instance.

The author concludes that the total of living children (13 per cent) in the entire series of 23 cases is disappointing. She is interested, however, in the possibilities offered by the method of using the polyethylene inlying tube, and she believes that improved results may be secured by a persistent antibiotic regime and by closer postoperative control of the patency of the reconstituted salpingouterine passages, including repeated insufflations with CO_2 gas.

—John W. Brennan, M.D.

MISCELLANEOUS

The Use of Sex Hormones in Gynecology (Die Anwendung der Sexualhormone in der Gynaekologie). K. G. Ober. *Geburtsh. & Frauenh.*, 1957, 17: 610.

At the time, 25 years ago, when the sex hormones were put into the hands of physicians, there were great expectations. It was believed that these substances would work wonders, and would be able to regulate hormonal dysfunctions. The clinical results soon showed however, that this was not always possible. Kiese made it clear that hormones are chemicals made by the human and animal organism, and that their therapeutic use always follows the laws of pharmacology.

One of the most effective uses for these hormones in gynecology is in cases of dysfunctional uterine bleeding. The endometrium was studied first and it was revealed that in 80 to 90 per cent of all cases of hemorrhage, the endometrium showed a pattern of prolonged or exclusive follicular stimulation. In the remaining 10 to 20 per cent the appearance of tissue more or less stimulated by corpus luteum hormone, but with different stages of degeneration, was found. Necroses, vascular changes, and hemorrhages inside the endometrium were seen. Usually no corpus luteum was found in the ovaries. Follicles grow in the ovaries, but the amount of estrogen does not increase with their growth. Hemorrhages are, therefore, due to an absolute or relative shortage of hormone. After castration, a woman begins to bleed, independent of the time of the menstrual cycle in which the procedure is performed.

A certain amount of estrogenic hormone administered over a period of time will result in vaginal bleeding after withdrawal. A certain amount of that hormone will result in bleeding after a certain time, because a relative shortage is developing, but an increase in the amount will then prevent or stop the bleeding. This is also true of corpus luteum hormone.

The treatment of dysfunctional bleeding is frequently possible with hormones; 200 mgm. progesterone with 10 mgm. estradiol over a period of 12 to 14 days is recommended. With this regimen 409 patients were treated, and the results were good in 405. The bleeding stops in about 30 hours. If the bleeding does not stop in 4 days, then its cause must be sought in something different, such as a miscarriage, an ectopic pregnancy, fibroid, polyp, or other tumor. The bleeding must be arrested for a minimum of 6 days, and usually for 9 days. If the period is less than 6 days, then the cause of this bleeding is probably mechanical and not functional. The duration of this hormonal "curettage" is frequently ling: 2½ days longer than usual and is sufficient, therefore, in only 70 per cent of the cases. It can last up to 12 days.

Recurrences occurred in 24 per cent of the women over 40 years of age. A period of amenorrhea of more than 5 weeks is possible. If these patients bleed longer than 1 week, they should receive other treatment. These recurrences can be prevented by administering progesterone (50 mgm.) or an oral substitute (25 mgm. for 5 days) for a short period after this hormonal "curettage".

The treatment of amenorrhea is more difficult and frequently is not successful. In irregular shedding of the endometrium, spotting is frequently noticed 2, 3, or more days before the menstrual period, and it is believed that the level of estrogen is decreased in comparison with that of progesterone. Treatment with 0.04 mgm. of ethinylestradiol for 7 days will relieve this disturbance. Another important use of sex hormones is in the castration and menopausal syndromes. The latter usually needs no or a very small amount of estrogenic hormone; the former, however, can best be treated with 200 mgm. of progesterone and 10 mgm. estradiol benzoate in crystalline form, given once monthly. In plasma cell endometritis, a dose of 20 mgm. of estradiol in 4 to 6 weeks is usually sufficient. In older women with suggested vaginal repair, 5 to 10 mgm. of estradiol in oil given 1 to 2 days before surgery, will result in better healing. Recently, new products have been placed on the market with the function of progesterone, such as the 19-nor-testosterones. Of these, the methyl-nor-testosterone is the most active one. With 1 mgm. per os daily, a rise in basal temperature can be obtained, but 7 mgm. are necessary to replace a surgically removed corpus luteum, in addition to 0.15 mgm. ethinyl estradiol to produce a premenstrual endometrium.

—Sylvain Van De Rijn, M.D.

Complications of Endometriosis of the Sigmoid Colon. C. Gordon Johnson, Anthony F. Coppola, and Charles R. Moll. *South. M. J.*, 1957, 50: 893.

Six cases of microscopically verified endometriosis of the sigmoid colon are presented to emphasize the incidence, clinical findings, and management of this condition. All of the cases reported required resection because of the lesion's location, extension, and the associated inflammation. Fear that the lesion might be malignant was the motive for operating in 3 of the patients.

During the period from 1946 to 1955, inclusive, the 6 patients represented .66 per cent of all cases of external endometriosis discovered during the performance of major gynecologic surgery at the Touro Infirmary, New Orleans. All of them were white patients. External endometriosis was diagnosed at this

clinic in 6.5 per cent of the major operative procedures.

Three of the patients were from the senior author's private practice. They represented 0.56 per cent of the patients on whom he performed a laparotomy and 4 per cent of the patients who had external endometriosis.

While the symptoms and signs usually associated with external endometriosis were encountered, the additional findings were obstruction of the bowel, a palpable, tender mass, and a narrow segment of bowel, well delineated on proctoscopic and radiographic examinations. In contrast to the findings in malignant conditions, the mucosa was not involved in any case.

The treatment is surgical excision of the involved bowel and end-to-end anastomosis of the sigmoid. In all 6 patients, the uterus and adnexa were removed. Castration by surgery or irradiation is never indicated as the sole procedure.

In 3 cases a correct preoperative diagnosis was made. In the remaining 3 the lesions were thought to be due to a malignant condition. A frozen section will help to clarify the problem in this type of case. A thorough clinical and radiographic evaluation prior to surgery will help to establish the proper diagnosis. In 3 patients conservative surgery had previously been employed without success. All required resection of the bowel within 2 years after the initial procedure. A follow-up of 1 to 7 years has shown no signs of any recurrence in these patients.

—*George C. Lewis, M.D.*

Detection of Gynecological Cancer; Use of Fluorescence Microscopy to Show Nucleic Acids in Malignant Growth. Ludwig von Bertalanffy, Marianna Masin, Francis Masin, and Leo Kaplan. *California M.*, 1957, 87: 248.

The authors have employed a new method in exfoliative cytology using fluorescence microscopy to reduce the time of processing and of scanning specimens. They pointed out that suspicious cells under certain conditions show a flaming orange-red fluorescence of the cytoplasm on a black background which is impressively distinct from normal cells and can be used as a warning signal to the scanning examiner.

They point out that modern research has shown that nucleic acids of the cell hold a key position in protein synthesis, growth, and carcinogenesis. By appropriate staining a differentiation can be pointed out between the two kinds of nucleic acids which are desoxyribonucleic acid and ribonucleic acid. The former is parenthetically identified as DNA and the latter, ribonucleic acid, as RNA.

The authors maintain that changes in the chromatin and desoxyribonucleic acid content of the nucleus appear in connection with mitosis and polyploidy which are found in advanced malignant disease, and that there is a high content of the ribonucleic acid in growing malignant cells along with other activity of high protein synthesis.

Using a fluorescent microscope with fluorescent dye, fluorochrome or acridine-orange, they are able to distinguish between the ribonucleic acid which gives a red fluorescence and desoxyribonucleic acid which gives a green fluorescence in the nucleus. Several microphotographs accompany the article which illustrate the fluorescent staining of normal and malignant tissue. These microphotographs are well done and show clearly very good examples of the authors' contention. They have compared the fluorescent material slides with the tissue biopsies and Papanicolaou stains to confirm their findings. They point out that this type of examination is applicable to cytology of tissue from the endometrium, stomach, breast, lung, and lymph nodes, in addition to the gynecological tissues.

In their discussion the authors contend that with this technique the staining procedure only takes 6 minutes and the examiner needs to average but 3 minutes per slide for scanning time. They say the acridine-orange method of screening shows the classical morphologic criteria of malignant disease, and also the cytochemical changes which are symptomatic of and probably basic in the diagnosis of malignant growth. They hope that the acridine-orange method will contribute toward the early recognition of malignant change.

It is their conclusion that the early detection of malignant lesions of the cervix, which is a major problem in gynecology, has been possible by the development of exfoliative cytology; but that mass screening programs have been impeded because of the demands on the time and skill of the examiners as practiced by our conventional techniques. They believe that further development of this fluorescent microscopic screening will lead to a more accurate and quicker diagnosis.

—*Robert J. McNeil, M.D.*

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Measurement of the Midpelvis with the Rectovaginal Pelvimeter to Minimize Exposure to Radiation. SAMUEL HANSON. *Am. J. Obst.*, 1957, 74: 494.

A RECTOVAGINAL PELVIMETER, first devised over 2 decades ago, is reintroduced by the author. This instrument was used in more than 10,000 cases. With it, all of the diameters of the midpelvis can be measured readily and accurately. X-ray pelvimetry can consequently be reduced to only one exposure, and even this one exposure can often be avoided. The hazard of genetic damage from exposure of the gonads to radiation can thus be minimized. —*Charles Baron, M.D.*

The Diagnosis of Ectopic Pregnancy. E. C. WOOD and ANNE MARTYN. *Med. J. Australia*, 1957, 2: 246.

FIVE HUNDRED PATIENTS WITH ectopic pregnancy were treated at the Royal Women's Hospital, Melbourne, Australia between 1950 and 1956. The presenting signs and symptoms have been reviewed in an attempt to reduce the difficulties associated with the diagnosis of ectopic pregnancy.

The history of previous pelvic infection was obtained in only 9 per cent of the patients, although evidence of previous infection was noted in 29 per cent of the patients at the time of laparotomy. Twenty-nine per cent of the patients had had previous abdominal surgery (16 per cent, appendectomy). A history of previous ectopic pregnancy was noted in 10 per cent.

The three most common symptoms were abdominal pain, amenorrhea, and abnormal vaginal bleeding. Abdominal pain was present in all but one case. Pain occurred prior to the abnormal bleeding in only 17 per cent of the cases. Amenorrhea was present in 75 per cent of the cases. Abnormal bleeding was noted in 85 per cent and could be divided into three types. The variation in type and amount of bleeding was such that it appeared that neither the type nor amount was of significance. Other symptoms frequently noted included faintness, morning sickness, vomiting, and diarrhea.

The commonly encountered signs consisted of abdominal tenderness, pain on movement of the cervix, and a tender mass or "bogginess." Abdominal tenderness was present in 95 per cent of the cases. Evidence of peritoneal irritation was much less common. An abdominal mass was noted in 15 cases (3 per cent). Pain on movement of the cervix was commonly observed (82 per cent). A clearcut adnexal mass was not found as a rule. However, "bogginess" or fullness in either of the adnexal regions or in the posterior cul-de-sac was found and confirmed in over 70 per cent of the patients. Shock was present in 25 per cent and fever in 17 per cent.

Needle aspiration was done 43 times and blood was obtained except in one case. Pregnancy tests were of no value. Endometrial scrapings were also not indicative of ectopic pregnancy in about half of the cases studied.

A careful evaluation of the patient's history and physical findings is essential to the accurate diagnosis of ectopic pregnancy. Sixty-five patients in the series were discharged with some other diagnosis, only to be readmitted later for surgery. The more obvious signs and symptoms of ectopic pregnancy were related to the amount of bleeding into the peritoneal cavity. A wide variety of diseases may produce a similar clinical picture, i. e., ruptured ovarian cyst, ruptured spleen, perforated appendix, perforated peptic ulcer, abortion, pelvic inflammatory disease, torsion of a pelvic tumor, and urinary tract infection.

—*James F. Donnelly, M.D.*

Pyelographic Changes in Pregnancy. A. S. BLIGH. *Brit. J. Radiol.*, 1957, 30: 489.

FIFTEEN PRIMIPARAS with no previous history of renal disease were studied by intravenous pyelography; first, when less than 3 months pregnant; second, 10 days after delivery; and third, 3 months after the second pyelogram. The lower ureters were not observed.

Only 5 subjects showed a recognizable change. Two of these were followed up with a fourth pyelogram 8 months after delivery.

It was concluded as follows:

1. Changes in the calyces and pelves are not common in primiparas during pregnancy, and such changes as do occur do not persist to a degree likely to give rise to chronic renal infection after delivery.
2. The findings of dilatation of the renal pelves and calyces, especially on the right side during pregnancy, are not themselves pathological.
3. The persistence of these changes is not necessarily pathological unless it is associated with both the clinical history and findings of chronic pyelitis.
4. No useful information can be obtained from the study of the ureters in these cases by intravenous pyelography.

It is considered that pyelographic abnormalities are likely to be due to a preceding pregnancy when (1) a history of renal symptoms and signs following a normal pregnancy and delivery is obtained, and (2) an imbalance is observed in the pyelographic findings on the two sides, the right being more severely affected than the left. No other findings to explain the discovered changes can be demonstrated.

—*Alan Rubin, M.D.*

Habitual Abortion Due to Insufficiency of the Internal Cervical Os; a Preliminary Report of 7 Cases Treated by a Modified Shirodkar Technique. V. B. GREEN-ARMYTAGE and J. C. MCCLURE BROWNE. *Brit. M. J.*, 1957, 2: 128.

DEFICIENCY OF THE INTERNAL CERVICAL OS is an occasional cause of habitual abortion. Such insufficiency may be either congenital or the result of trauma at gynecological operation, during childbirth, or at miscarriage. Deficiency may be suspected from the history of repeated early rupture of the membranes fol-

lowed by abortion, and may be demonstrated in the nonpregnant woman by special x-ray technique, or by the passage of a No. 4 cervical dilator freely into the uterine cavity. During pregnancy it may be confirmed by the observation that the membranes are bulging and that the cervix is partially dilated in the absence of bleeding or obvious uterine contractions.

The technique of the method of re-enforcement of the inefficient internal os is described. This technique consists of placing a nylon suture, 7 N or 8 N in size, submucosally around the internal os of the cervix. By blunt dissection the submucosa and bladder are pushed upward to expose the region of the histological internal os, which lies about 1.5 inch above the external os. The suture is carefully threaded through this region and tied behind the cervix to avoid irritation of the bladder. A second or even third nylon ligature may be passed and secured if it is deemed necessary. The ligature is secured and tied with very little tension.

The method of delivery, when there is no other obstetric indication, is to allow the patient to go into labor and divide the suture at the beginning of labor. If labor proceeds normally within 48 hours, operative intervention is not indicated. If, however, after division of the suture, delivery is not imminent after 48 hours, cesarean section is desirable.

Seven cases treated by this technique are described, 5 of the women have been delivered and 2 are not as yet pregnant.

In an addendum, 5 more patients were operated on between the fifteenth and twentieth weeks of pregnancy. None aborted, and all of the pregnancies proceeded successfully to term. —*Harry Fields, M.D.*

LABOR AND ITS COMPLICATIONS

Umbilical Cord Prolapse; Analysis of 97 Cases. Luciano S. J. Sotto and Robert Villeneuve. *Obst. Gyn.*, 1957, 10: 303.

Prolapse of the umbilical cord may be expected in about 0.25 per cent of all deliveries. About 30 per cent of the cases occur prior to term. In recent years, the incidence of this complication has not decreased.

The predisposing causes of cord prolapse include maladaptation of the presenting part (transverse lie, breech, disproportion, prematurity, multiple pregnancy, abnormal placentation, and spontaneous rupture of the membranes without engagement), anomalies of the cord, and certain injudicious obstetric manipulations, such as untimely midforceps or artificial rupture of the membranes when the fetal head is high. In about 15 per cent of the cases, no etiologic factor is apparent.

Fetal mortality, always high, has ranged between 35 and 50 per cent in several recent series. The prognosis is poor if cord pulsations are weak or absent and if the cervical dilatation is less than 7 cm. at the time of diagnosis. A breech presentation also is associated with a high mortality because it invariably is associated with an external rather than an occult cord prolapse.

The authors report a series of 97 cases with an uncorrected mortality of 22 per cent. These good results are attributed to the fact that the majority of cases were favorable (cord pulsations plus a cervical dilatation of at least 7 cm.) and that vaginal procedures such as cord reposition, use of the Voorhees bag, and the Braxton Hicks version were never employed. The most satisfactory methods of delivery were cesarean section (22) and version with extraction (22). Each yielded a fetal mortality of 9 per cent. The mortality associated with forceps delivery (20) was 20 per cent and with breech extraction (33) was 36 per cent.

In order to reduce the incidence of this obstetrical hazard, it is suggested that injudicious obstetrical manipulations be avoided. Particularly, artificial rupture of the membranes, increasingly popular in recent years, should not be attempted if the head is unengaged. This maneuver alone was responsible for 14 cases with a fetal mortality of 28 per cent.

—*Lester T. Hibbard, M.D.*

PUERPERIUM AND ITS COMPLICATIONS

Routine Third-Stage Exploration of the Uterus. Samuel T. Thierstein, Herbert C. Jahn, and Karlheinz Lange. *Obst. Gyn.*, 1957, 10: 269.

Routine manual exploration of the uterine cavity following the third stage of labor is recommended as a means of eliminating the complications of retained secundines as well as of detecting pelvic abnormalities. Three thousand consecutive women were treated by means of digital curettage, fresh gloves being used only if there had been a break in technique. In addition, manual removal of the placenta was done whenever placental separation was delayed. In nearly all cases, small shreds of placenta and membrane were obtained and, in one of 12, placental fragments up to 4 c.c. in size.

When this series of patients was compared to a series of 1,000 patients delivered without uterine exploration, less morbidity, less blood loss, and fewer transfusions were noted. No patient required prolonged hospitalization because of exploration. Routine antibiotics were not necessary.

The lower morbidity among the explored group is attributed to the removal of placental tissue which is potentially capable of harboring infection. Decrease of blood loss after delivery is attributed to internal massage which improves muscle tone. Pelvic tumors, weak areas in the uterine wall, and congenital abnormalities were more easily detected. Delayed separation and adherent placentas were immediately and successfully treated.

It is the authors' opinion that this procedure offers advantages which will result in it becoming a necessary part of good obstetrical technique.

—*Lester T. Hibbard, M.D.*

NEWBORN

The Present Indications for Exchange Transfusion of the Newborn (Les indications actuelles de l'exsanguino-transfusion chez le nouveau-né). Th. Boreau and G. David. *Presse méd.*, 1957, 65: 715.

Indications for exchange transfusion in the newborn have been enlarged in the course of the last few years for several reasons. First, it has been recognized that in severe cases of hemolytic disease

of the newborn due to maternal anti-Rh isoimmunization, such transfusions not only increase the prognosis for life but especially diminish the frequency of kernicterus. Second, exchange transfusion has been extended to the treatment of severe forms of hemolytic disease of the newborn due to ABO incompatibility. Third, exchange transfusions have also been carried out in cases of intense icterus of premature infants, not related to any fetal-maternal blood incompatibility.

The occurrence of kernicterus is fairly well related to the indirect bilirubin level, the critical level being around 18 to 20 mgm. per cent, although it certainly varies from laboratory to laboratory. Serum bilirubins are easiest to follow, but there are probably other pigments which may produce the actual nuclear damage. In vitro studies show that bilirubin solutions markedly decrease cerebral oxygen consumption in the newborn rat. Perhaps this is involved in the mechanism seen in man.

In blood incompatible hemolytic disease of the newborn, nervous signs appear only rarely before the forty-eighth hour, but are no longer to be feared after the fifth day. On the other hand, in severe icterus of the premature infant, typical nervous symptoms appear later, rarely before the fourth day and as late as the seventh. Otherwise the two conditions are quite similar.

Decision for exchange transfusion must be made rapidly; therefore a certain plan of action must always be in mind.

In hemolytic disease of the newborn, exchange transfusion is indicated immediately, if jaundice of the skin or the cord is observed, with or without splenomegaly, within the first few minutes of life. It is then an emergency measure. One should not wait for the results of the chemical tests. However, unless anasarca is present, one should determine the blood group and make a Coombs' test.

Even such heroic measures fail at times to assure a benign subsequent course. Additional exchange transfusions may be required, the authors having performed as many as four in 72 hours. Usually only one will be necessary. During 1956 the Central Department of Blood Transfusion performed one exchange transfusion in 159 cases, two such transfusions in 67 cases, three in 11 cases, and four in 5 cases.

In cases in which jaundice appears late, the condition may be very mild and not indicate transfusion. But there are cases in which the course is severe and progressive, although late in appearance. These infants are especially in danger, since the severity of their disease may be misleading and proper therapy be postponed. Again the critical level of bilirubin is around 18 mg. per cent. Repeated exchange transfusions may be necessary and, if possible, they should follow intervals of about 10 hours.

If the child is first seen after the fifth day without signs of kernicterus, only an extremely high bilirubin level may justify transfusion, but some blood may be required for an anemia.

In a child seen late with signs of kernicterus, the authors have never seen transfusion effect an immediate change in the neurological status. As to an action on the sequelae, at times, the authors have had the impression that there was such an action, but they admit that spontaneous recovery may have occurred instead.

On the Service of the Central Department of Blood Transfusion during 1956, exchange transfusion was performed for the following cases of ABO incompatibility: 28 transfusions for 28 cases of HDNB due to anti-A, 6 for 6 cases of HDNB due to anti-B, 346 for 242 cases of HDNB due to anti-Rh (system).

ABO incompatibility is diagnosed when anti-Rh isoimmunization is eliminated in a severe, often rather early-appearing icterus. It is not sufficient to say that the child be A or B and that the mother is O; maternal hemolysins or immune antibodies must be demonstrated. The Coombs' test, however, will often be negative, regardless of the refinement of technique.

If all the tests affirm the diagnosis, is exchange transfusion always indicated? Certainly not, for such tests are sometimes positive in the absence of disease and, besides, many of these children recover without sequelae. Nevertheless, typical kernicterus does occasionally follow. The serum bilirubin level is the most dependable indication for treatment; exchange transfusion is not indicated if the critical level is not reached by the fifth day.

Numerous cases of kernicterus are seen in intense icterus of the premature infant (birth weight, 2,500 gr.) in the absence of blood incompatibility. In these cases the critical serum bilirubin levels are lower than the 18 mgm. per cent seen in full term infants. (Kernicterus has even been seen at 12 mgm. per cent.) If this factor becomes more critical, so do others—the chief of which is anoxia. Therefore, the gain of decreased bilirubinemia must be weighed against the increased risk of exchange transfusion.

—*W. Newlon Tauxe, M.D.*

Atresia of the Esophagus with Esophagotracheal Fistula in a Newborn Infant (Atresia esofagea con fistola esofago-tracheale in neonata). FRANCESCO CAMINITI. *Arch. ostet. gin.*, 1957, 42: 81.

A CHILD, observed on the Obstetrical and Gynecologic Service of the University of Cagliari, Island of Sardinia, Italy, died about 48 hours after birth. Nothing abnormal was encountered at autopsy except atresia of the esophagus and an esophagotracheal fistula, with the sequelae of a bronchopneumonia. However, the child was delivered by a primigravida with nephropathic gestosis; the child itself was a premature female.

The specimen disclosed a proximal portion of the esophagus which ended somewhat above the tracheal bifurcation in a blind sac. This sac was uniformly covered and had a typical esophageal epithelial lining. The distal portion of the esophagus was implanted normally at the gastric cardia of the esophagus and passed upward to end in the fistulous opening into the trachea. This portion and the fistulous opening were also uniformly epithelialized, the whole being without evidence of the sequelae of trauma or infection. The typical epithelial lining of the trachea passed by means of a transitional form into the typical epithelial lining of the esophagus. The aper-

ture of the fistula was only a short distance above the tracheal bifurcation.

Since none of the reported instances of this anomaly seems to have been diagnosed in time to institute surgery, the author emphasizes the early symptomatology. He discusses the suffocative attacks with initiation of the attempts at feeding, the early salivation (inability to swallow), the early distention of the abdomen (pulmonary air gaining access to the stomach, or Brenneman's sign), the absence of epithelial debris in the meconium (Faberi), and the instrumental moduses (esophageal sondage, esophagoscopy, and tracheoscopy). The author does not recommend the roentgen examinations using opaque substances, because of the danger of regurgitation with invasion of the bronchial tree by the shadow-casting medium. For somewhat the same reason, treatment by means of gastrostomy is not advised; the author would prefer feeding of the child through a jejunostomy opening.

As to pathogenesis, the author accepts the theories of Zeit and Ribbert of embryologic separation of the common tracheoesophageal canal by the union from below upward of the tracheoesophageal epithelial crests early in embryonic life; however, he differs from these authors with reference to the developmental disturbance which results in the formation of the anomaly discussed. The author believes that the portion of the thus produced tracheoesophageal diaphragm which tends to grow backward toward the posterior esophageal wall is that portion which is avove the future fistulous communication; otherwise, according to Zeit's theory, it would be the lower portion of the esophagus which would end as a blind sac.

—John W. Brennan, M.D.

MISCELLANEOUS

The Treatment of Hemorrhages Resulting from Blood Incoagulability in Obstetrics; 20 Personal Observations (Le traitement des hémorragies par incoagulabilité sanguine en obstétrique; a propos de 20 observations personnelles). P. Guilhem, A. Pontonnier, M. Monrozies, R. Bierme, and J. Ducos. *Gyn. obst.*, Par., 1957, 56: 19.

Prompt recognition and effective therapy of blood incoagulability in obstetrics are essential for the best results in treating hemorrhage. An understanding of the pathogenesis and clinical picture of blood incoagulability will guide the therapist in the proper management of the problem.

Blood incoagulability results from a combination of the effects of thromboplastin and fibrinolysin. It is important to note that the afibrinogenemia which results is only the terminal phase and that there is general depletion from the plasma of all factors associated with clotting. The initial step in this process is an injury to the placenta or decidua. Thromboplastin is released by the damaged tissues. Clotting and reactive lysis of clots by fibrinolysin may then follow. The entire process may be localized within the uterus without effect upon the systemic circulation. Blood coming from the vagina in these cases may exhibit failure to clot or there is rapid lysis of clots that do form. In most cases the local changes may proceed and then be associated with changes in the blood everywhere. If thromboplastin or fibrinolysin are gradually released into the blood stream by repeated uterine contractions the development of incoagulability may be slow. With massive release of these factors or amniotic fluid into the general circulation the process may be very abrupt. Hemorrhage associated with delivery or abortion may serve to accelerate the onset of incoagulability.

The following tests are recommended for venous blood since all can be completed within 15 minutes:

1. Coagulation time with observation of clot lysis.
2. Quick and Howell times. The Howell test should be checked by the use of a control normal plasma.
3. Thrombin time. This should be checked by the use of fibrinogen.

When the threat of blood incoagulability exists these procedures should be performed and the vaginal bleeding should be checked for clotting ability. If vaginal blood does not clot but the tests reveal no venous blood changes it may be presumed that the process is still incipient. Prompt therapy will result in effective control. If the tests reveal defects, therapy may be effective in most cases.

While blood loss should be promptly replaced, the specific therapy of incoagulability is the immediate use of reconstituted plasma, double its normal strength. Stored blood plasma should be utilized but only half the usual amount of water should be added. This should be administered as soon as the blood has been drawn for the tests. In this manner all the elements necessary to prevent incoagulability may be replenished. In addition, the plasma will restore the blood volume and re-establish vasomotor equilibrium through the plasma proteins. The use of fibrinogen, or whole blood alone, is not recommended.

Primary surgical therapy, i.e., hysterectomy, is not recommended. Hysterectomy is only of value when it is felt that the uterus will represent a persistent source of thromboplastin which may cause a recurrence of the syndrome.

—George C. Lewis, Jr., M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Pheochromocytoma; Report of 5 Cases, 1 a Spontaneous Cure. D. D. ALBERS, E. H. KALMON, and K. C. BACK. *J. Urol.*, Balt., 1957, 78: 301.

THE AUTHORS present details concerning 5 cases of pheochromocytoma. They point out that these cases were discovered during a period of 4 years in a community from which none had previously been reported. In each case confirmatory evidence of the presence of pheochromocytoma was obtained by demonstration of pressor substances in the urine of the patient. The injection of the patient's urine into a dog resulted in a pressor response. Retroperitoneal pneumograms provided valuable aid in localizing the tumors in the 4 cases in which this method was employed.

In one patient apparent cure resulted from spontaneous hemorrhage into the tumor. In the only malignant pheochromocytoma in the series the neoplasm was ectopic, had surrounded the pedicle of the right kidney, and extended into the vena cava. In another case a tumor was found in each adrenal gland and a third neoplasm was discovered posterior to the superior pole of the left kidney.

—Laurence F. Greene, M.D.

Carcinoma of the Adrenal Cortex Without Endocrine Effects. K. F. WOOD, F. LEES, and F. D. ROSENTHAL. *Brit. J. Surg.*, 1957, 45: 41.

CARCINOMAS OF THE ADRENAL CORTEX are rather rare in as much as only 27 cases have been published since 1923. The authors present 8 case reports and emphasize the following findings which may be of value in early diagnosis and treatment.

1. Pyrexia. This was present in all patients seen and in 11 of the previously recorded cases. It is probably due to the dissemination of products of tissue breakdown from necrotic areas of the tumor. In one case, when the tumor was removed, the patient became afebrile and fever recurred when metastasis developed. The pyrexia was intermittent and the maximum range rarely exceeded 38 degrees Centigrade.

2. Pain. Two-thirds of the patients complained of pain in the loin or hypochondrium, which was frequently not severe but similar to the pain of renal origin with which it was confused.

3. The fatigue syndrome. There was a nonspecific syndrome of weakness, malaise, sweating, weight loss, and anorexia which occurred in adrenocortical carcinoma long before the tumor was clinically manifest. The complaint frequently coincided with the time of the fever.

4. Tumor. An abdominal mass was palpable in one-third of the cases. When the carcinoma arises from the left adrenal gland, it may displace the spleen downward and forward causing it to become palpable below the costal margin.

5. Distant metastases. Adrenocortical carcinoma may be present with symptoms and signs unrelated to the primary growth, the existence of which may be unsuspected.

In early diagnosis, the sedimentation rate was markedly raised in 4 cases. The plain film of the abdomen and excretory urogram may show downward displacement of the kidney or compression deformity of the upper calices. Perirenal air insufflation has been claimed as useful. The authors did not use this particular method. Aortography may prove helpful and, in the presence of a large tumor, a barium enema and barium meal may show displacement of the stomach or colon. In patients presenting an abdominal mass, exploratory laparotomy is mandatory. In patients not presenting an abdominal mass, the average time to reach the diagnosis is almost 5 months. The fatigue syndrome is nonspecific and the pain may not be severe. In these cases, early diagnosis is only possible if the condition is constantly considered.

These tumors are not radiosensitive; their treatment is surgical extirpation. Of all the 35 patients observed, only 2 survived 5 years. *—Robert O. Beadles, M.D.*

Indications for and Prognosis of Plastic Procedures in Congenital Mechanical Hydronephrosis. (Genese, Indikation und Prognose organerhaltender Eingriffe bei angeborenen mechanischen Hydronephrosen). A. GÜTGEMANN, G. KARCHER, and K. H. LINKE. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1957, 285: 438.

THE AUTHORS divide hydronephrosis into two classifications, mechanical and dynamic. Surgical exploration of large hydronephrotic kidneys practically always demonstrates a mechanical obstruction to drainage. Although large hydronephroses of dynamic origin do occur, combined involvement of the kidney and ureter, and at times the bladder, is by far more frequent. Urological study should allow differentiation between these two entities.

The etiology of mechanical obstruction is rather obscure. There usually are intraureteral and extraureteral factors. The condition is congenital and mostly represents an error in embryonic development. Aberrant vessels, in the authors' experience, hardly ever play a significant role, but fibrous bands and contractures secondary to perinephritis are important.

The condition becomes evident most frequently in the third or fourth decade. Sixty per cent of the patients are male, 40 per cent female. Bilateral involvement is not infrequent. Early symptoms are ureteral colic (85 per cent), sensation of pressure in the flank after intake of large amounts of liquids (74 per cent), recurrent infections (47 per cent), pyuria (52 per cent), hematuria (40 per cent), and renal calculi (30 per cent).

Pyelography is needed to exclude obstruction by a ureteral calculus. The diagnosis is based on the dilatation of the renal pelvis, the delayed emptying of the renal pelvis, and the pointed upper ureter on retrograde filling.

The authors urge early operation. The size of the renal pelvis and the degree of impairment of renal

function are insignificant as long as the thickness of the renal parenchyma measures 1 to 2 cm. in the adult and .5 to 1 cm. in the adolescent. They do not agree with Hinman's thesis of "renal counterbalance" and will attempt plastic surgery on a markedly dilated kidney with considerable impairment of function in the presence of a normal kidney on the other side as long as the aforementioned criteria are met. Continued excretion of contrast medium after one hour in intravenous pyelography is considered an indication for surgery.

The authors classify their postoperative results as excellent in 25.6 per cent, good in 38.5 per cent, satisfactory in 23.1 per cent, and unsuccessful in 12.8 per cent.

They use the Deuticke triangular flap technique with or without resection of the pelvis almost exclusively. Aberrant vessels, if encountered, are left alone. Careful ureterolysis, however, is done in the presence of adhesive bands and contractures. All other techniques including the Fenger, Foley, Schwyzer, von Lichtenberg, and Davis procedures have not proved successful in the authors' hands except under specific conditions. The Deuticke triangular flap technique is somewhat similar to the Culp flap procedure. The Culp technique was not included in the list of procedures which proved unsuccessful. The procedure consists of incising the proximal ureter and suturing a triangular flap fashioned from the renal pelvis into the ureteral defect. The base of this triangular flap is towards the parenchyma and not towards the junction as in the Culp technique. If the pelvis is excessively large it is resected after the triangular flap has been cut. The ureteropelvic junction is splinted for from 10 to 14 days and nephrostomy drainage is maintained for 21 days. A nephropexy is always done.

—Heinz E. Cron, M.D.

Treatment of Renal Tumors (Zur Behandlung der Nierentumoren). W. BRINKMANN and H. FLICK. *Langenbecks Arch. u. Deut. Z. Chir.*, 1957, 285: 258.

THE AUTHORS' experience in the management of renal neoplasms is based on a series of 142 cases. In this entire series the diagnosis was verified by histological examination of the surgical specimen. The cases are classified as tumors of the renal pelvis, tumors of the renal parenchyma, and tumors of the renal capsule. Tumors of the renal pelvis are subdivided into papillary and nonpapillary lesions. The papillary lesions include histologically benign papillomas and infiltrating papillocarcinomas. Nonpapillary tumors, called solid carcinoma by the authors, include squamous cell carcinomas and adenocarcinomas. Tumors of the parenchyma predominate in the series.

In the management of a papillary lesion of the renal pelvis the authors perform a total nephroureterectomy including a cuff of bladder wall surrounding the ureteral orifice. Lesions of the bladder which might be present at the same time are treated by transurethral resection and fulguration, preferably at one sitting.

"Solid carcinoma," that is squamous cell carcinoma and adenocarcinoma of the renal pelvis, in the authors' experience practically never metastasizes to the ureter or bladder. The authors do not believe that total ureterectomy is indicated in the presence of such a lesion and the management consisted of a nephrectomy with removal of the proximal ureteral segment as far as it could be reached through the nephrectomy incision. This is not generally an accepted principle and many authors stress the necessity of a total nephroureterectomy in the treatment of any tumor of the renal pelvis.

In the presence of a tumor of the renal parenchyma the authors perform a nephrectomy including removal of the perirenal fat, preferably en bloc. The preferred incision is a flank incision with resection of the twelfth rib. An attempt is being made to clamp the renal pedicle as early as possible during the surgical procedure. The surgical attack upon renal tumors of infancy is the same as that for tumors of the renal parenchyma in adults.

The value of deep x-ray therapy in the treatment of renal tumors is equivocal. However, on purely empirical grounds the authors use postoperative x-ray therapy up to a total dose of 3000 roentgens in all their patients who are nephrectomized for tumor. In the presence of solitary metastases removal of the solitary lesion followed by excision of the primary renal tumor is the recommended procedure. If there are inoperable metastases, removal of the primary renal tumor may increase life expectancy and at times be followed by regression of the metastatic lesions. In the presence of multiple inoperable metastases removal of the primary tumor is recommended only for the management of intractable hemorrhage. Deep x-ray therapy is the treatment of choice for metastases which appear postoperatively unless they are solitary and lead to surgical excision. The authors' survival rate in papillary tumors of the renal pelvis is extremely favorable; 66.7 per cent survived 3 years and 60 per cent 5 years.

The prognosis in "solid carcinoma" of the renal pelvis is extremely poor and the period of postoperative survival is given as 7.5 months by several workers. Two of the authors' 4 cases, however, survived for periods of 5 years without evidence of recurrence. Of those with tumors of the renal parenchyma, 46.6 per cent survived 3 years, 40 per cent 5 years, and 24.2 per cent 10 years. Of those with malignant tumors of childhood, one patient who was operated upon at the age of 13 survived 10 years, another one is still alive 4 years and 10 months later. One patient with a tumor of the renal capsule survived 5 years; the fate of the others with this tumor is unknown.

—Heinz E. Cron, M.D.

Ureteral Regeneration; Delayed Urinary Flow in the Healing of Unsplinted Ureteral Defects. FRANK HINMAN, JR., and RUDOLF OPPENHEIMER. *J. Urol.*, 1957, 78: 138.

EXPERIMENTS WERE DESIGNED to determine whether temporary exclusion of the urinary flow had any effect on the healing of experimental ureteral defects.

A portion of the ureter was excised in 15 dogs. In 7, a temporary obstruction of the ureter was created by means of polyethylene-covered wire, the ends of which were left under the skin in order to simplify removal. In 8 dogs the ureter was occluded permanently. In 4 dogs free urinary flow was permitted with open ureterotomies.

Permanent diversion was found to allow early epithelization and reformation of the ureteral lumen with consequent good muscle regeneration.

Temporary "diversion" of the urinary flow allowed better healing than free flow but did not prevent some leakage at the ureterotomy site and consequent abnormal healing.

The authors conclude that urinary flow delays primary epithelization, retarding muscle regrowth, and results in imperfect ureteral repair.

—*Rudolf Oppenheimer, M.D.*

Experimental Research on the Ureteroileoplasty with Seromuscular Ileal Loop (Recherches expérimentales sur l'urétéro-iléoplastie avec greffon ileal seromusculaire). Ion Rovinesco. *J. urol. méd.*, Par., 1957, 63: 256.

During the past 6 years the author has performed experimental research in Bucharest, using an isolated ileal loop to replace segments of the bladder and ureter. While the intestinal loop can be used to replace portions or all of the ureter, many authors have stated that a ureteral segment should, if possible, be conserved, and careful ileovesical anastomosis should be performed with nonperforating, nonreabsorbable sutures followed by reperitonealization. There are certain disadvantages of this type of plastic operation, however, because the mucosa of the ileal loop remains in contact with urine thus causing hypersecretion of mucus, which in turn favors infection, stasis, and dyskinesia.

The author has proved that this abundant secretion of mucus is due to the conservation of the vasculoneural pedicle, which of necessity, must remain attached to the general mesenteric circulation and nerve supply. In this manner, the isolated ileal loop remains a part of the digestive system. He has also severed the blood and nerve supply of these isolated enterocystoplastic loops 4 to 5 months after surgery. These dogs were then sacrificed at the end of 9 and 10 months and on microscopic examination, metaplasia of the intestinal epithelium, the cylindrical epithelium being transformed into stratified pavement cells, was seen. Macroscopically the plastic segment looked like normal bladder tissue.

The author has devised an operation to avoid this hypersecretion of mucus with the subsequent infection and secondary formation of calculus that are the great disadvantages of this type of surgery.

The operation was performed on 25 dogs with excellent results. Three animals were lost from pathological conditions resulting from the separation of the ureterointestinal anastomosis. Twenty-two animals survived and were later sacrificed at various intervals. On reoperation 19 of the animals were found to have kidneys that appeared grossly normal. In 19 dogs the kidneys microscopically showed discrete perivascular fibrosis without interstitial sclerosis, and in the rest, the kidneys appeared normal. In 3 cases there was a reduction in the size of the kidney, adjacent to a cortical abscess, but without severe pyelonephritis, although the ureter and the pelvis were dilated. The ureter and pelvis were found to be somewhat dilated in 10 dogs and normal in 12. In 24 dogs the ileoureteral and ileovesical anastomoses were permeable. It was noted that there was an absence of mucus within the ileal loop and the previously removed mucosa had not reformed on the external surface. From a functional viewpoint, urographic and pyelographic examination showed a normal tract in 19 cases, the urographic media being eliminated in 4 to 6 minutes. In 3 cases there was dilatation of the ureter and pelvis but the upper urinary tract could be urologically demonstrated. The humoral studies showed a hyperchloremic syndrome in 3 dogs. In the remainder of the 19 cases, there was clinical evidence of immediate postoperative electrolytic imbalance, but later when compensation had taken place, the studies showed normal renal function. Since this type of operation has been so successful in 19 of 25 dogs, the application of the surgical technique in the human being could readily be considered.

The following surgical technique was used in this experimental research. First an ileal loop of suitable length, 15 centimeters from the ileocecal angle, was isolated. The normal continuity of the bowel was established by terminoterminal anastomosis. The mesenteric blood supply of the ileal segment was carefully preserved. The loop was opened lengthwise .5 centimeter anterior to the mesenteric border. The slight hemorrhage produced by this procedure was spontaneously arrested. The fourth procedure was the very careful removal of the mucosa with a bistoury from the opened segment of gut. The next step was to reverse the surfaces to produce a cylinder with the serous membrane on the interior and submucosal layer on the outside. The cylinder was formed by bringing the cut edges together with chromic catgut perforating sutures. The vessels of the mesentery must be carefully avoided and preserved. The sixth operative step was to section the upper end of the ureter and implant it into the ileal cylinder, using the Coffey technique. The inverted ileal segment was then attached to the bladder with a terminolateral anastomosis. Retroperitonealization of the entire anastomosis was then performed and the abdominal cavity closed.

—*Conrad A. Kuehn, M.D.*

BLADDER, URETHRA, AND PENIS

Congenital Bladder Neck Obstruction in Children. Rogers Deakin. *J. Urol.*, Balt., 1957, 78: 384.

The data presented concern 56 children with congenital obstruction of the vesical neck, 32 of whom had marked dilatation of the upper part of the urinary tract treated by a number of physicians using a variety of methods. Bilateral pyeloureterectasis was predominant in males, whereas chronic pyelonephritis was the chief complication in females.

The author states his belief that the immediate therapy should be directed to preservation of renal anatomic integrity and renal function. It is necessary, therefore, to recognize the urgency of adequate renal drainage and to employ the best surgical means to insure prompt relief of obstruction at the renal level. Toward these ends the author strongly advocates ureterostomy drainage by means of T tubes. His studies indicate that correction of obstruction at the vesical neck by the transurethral approach, associated with drainage of the upper part of the urinary tract

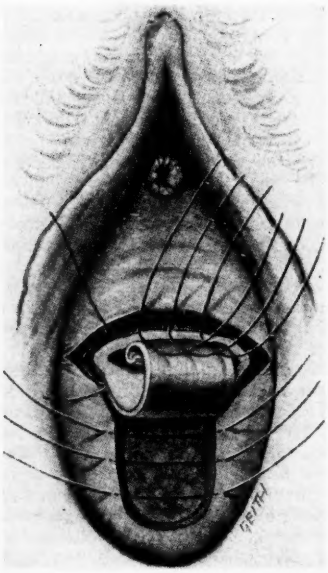

FIG. 1 (Rodeck).

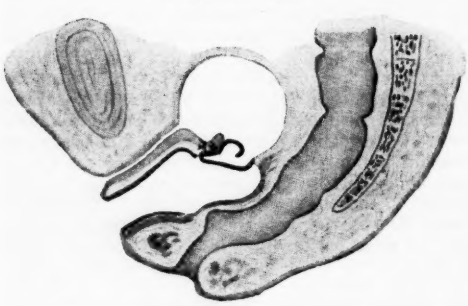

FIG. 2.

by ureterostomy, has produced better results than other forms of treatment.

—*Laurence F. Greene, M.D.*

The Treatment of Vesicovaginal Fistula According to the Technique of Döderlein (Zur Behandlung der Blasen-Scheidenfistel mit der Einrollplastik nach Döderlein). G. RODECK. *Zschr. Urol.*, 1957, 50: 237.

ANYONE who has dealt with the problem of vesicovaginal fistula is aware of the fact that it is frequently difficult to cure this condition by surgical means. This is especially true for the vesicovaginal fistulas which follow radiation therapy. The tissues are then quite sclerotic, the bladder is shrunken and fixed to the surrounding tissues, and it is impossible to mobilize the edges of the fistula in order to obtain a tension free closure.

A procedure devised by Döderlein gives promise of being successful in cases of this sort. According to this technique, which is most suitable in women who have had total hysterectomy, a flap is raised from the posterior vaginal wall. The flap (see Figs. 1 and 2) is rolled up and used to plug the fistulous opening and is fixed in position by sutures. The author finds that this technique is feasible also in women who still have a uterus and reports the case of a 65 year old woman who had extensive radiation for cancer of the anterior vaginal wall in whom the Döderlein procedure was carried out successfully. She had a large vesicovaginal fistula. Biopsy preoperatively showed that the cancer was cured, and it was therefore feasible to attempt to close the vesicovaginal fistula. The author recommends this procedure not only for vesicovaginal fistula but also thinks it could be useful in cases of rectovaginal fistula.

—*S. Richard Muellner, M.D.*

Transcystoscopic Injection of Radioactive Colloidal Chromic Phosphate into Tumors of the Bladder. WILLIAM R. CHRISTENSEN and ROBERT G. WEAVER. *J. Internat. Coll. Surgeons*, 1957, 28: 138.

THIS ARTICLE details an attempt to develop a technique for the use of radioactive isotopes in injection of carcinoma of the bladder. In the preliminary studies, a dilute solution of colloidal carbon was injected into the bladder of dogs and colloidal chromic phosphate was used in the same manner. Study of the results obtained show that the dogs given carbon had the best distribution when 0.5 of a cubic centimeter was injected at half centimeter intervals. Grossly, the confluence of particles was uniform and continuous throughout the muscularis. Roentgen autographs showed that radioactive colloidal chromic phosphate behaved interstitially in a manner parallel to that of the colloidal carbon. Here, intervals of 0.5 centimeter and volumes of 0.5 c.c. containing 25 microcuries of radioactive chromic phosphate gave the most desirable distribution of radiation. A uniform spread was also obtained by injecting 1 c.c. at intervals of 0.5 centimeter. When the distance was increased to 1 centimeter, however, the area showed definite patchy distribution. Roentgen autographs taken 24 hours after the injection showed strict localization which became confluent after 48 and 72 hours. It was also noted that there was practically no escape into the perivesical tissues. Quantitative assay showed nearly complete retention of the isotope in the bladder wall after 60 hours.

Technique of injection. Spinal anesthesia was used, as well as a No. 24 Brown Burger cystoscope and a No. 6 French ureteral catheter, to one end of which a ¼ inch 25 gauge needle was attached and to the other a regular luer-lok adapter. For protection of the operating surgeon, a polyethylene sheet was gathered to fit lightly above the head and form a complete waterproof hood. Glass spectacles were glued to holes cut in the plastic. Two pairs of rubber gloves were worn to provide protection. Two cubic centimeters of indigo carmine or methylene blue were placed in the chromic phosphate for visual tagging of the isotope solution. The surgeon placed the needle at the point desired and the injection was done by the assistant. After completion of the injection, the bladder was finally filled through the cystoscope and then emptied into an enameled receptacle. The wash water was

then poured into an enameled sink in which water was running. All equipment was immediately placed upon the isotope table. The patient was then monitored and returned to his room with no further precautions. He was usually discharged after 24 hours of hospitalization and a cystoscopic check was made in 6 weeks.

The authors used this technique on 6 patients who had either grade 3 or grade 4 papillary carcinoma. In approximately 60 per cent there was marked hematuria beginning 3 weeks after the injection and lasting for 2 to 3 weeks. In these cases only one-third to one-half of the tumor area was treated by injection and so far no stricture has resulted; hydronephrosis has subsided in these patients. The authors use P^{32} which has a half life of 14 days; consequently, there is a reasonable latitude in time for receiving shipments and performing injections, and since P^{32} is a pure beta emitterant it offers safer handling with less exposure to personnel than isotopes with gamma emission. All safety precautions in handling the isotopes are aimed primarily at keeping them off of any exposed cutaneous surface as they are extremely tenacious and require immediate vigorous scrubbing to achieve adequate removal. Repeated injections have been done at intervals of 30 to 60 days accompanied by cautious check of the blood picture. It has been observed by others that 4 to 5 per cent of the injected isotopes are absorbed into the blood stream, but it is believed that with the doses used they do not cause appreciable changes.

This approach can be used where a needle can be introduced. It is especially well adapted to the vesical neck or the trigone and the posterior portion of the male urethra. It is the authors' present impression that the injections are best confined to small multiple tumors or to single ones under 3 centimeters in diameter. —*Robert O. Beadles, M.D.*

Intravesical Radiation Therapy with Co^{60} (Ueber intravesikale Bestrahlung mit Kobalt, Co^{60}). HANS-DIETER MARQUARDT. *Zschr. Urol.*, 1957, 50: 270.

THE AUTHOR describes his experience with the treatment of vesical neoplasms with intracavitary cobalt (Co^{60}). One hundred ninety-seven patients were so treated. Twenty-four of the patients were treated by means of Foley catheters, the balloon of which had been filled with a solution of cobalt chloride. The remaining patients were treated with specially prepared catheters in which the Co^{60} was applied to the external surface of the balloon. These catheters were prepared in four different ways with the cobalt applied to a portion of the bag in three and to the entire balloon surface in one.

The author feels that this method has the following advantages: (1) avoidance of contamination with radioactive substance, (2) exact dosage, (3) optimal localization, (4) simple technique, and (5) protection of normal tissue.

Intracavity radiation was used in 88 cases of primary solid carcinoma, 62 cases of papillary carcinoma or papilloma, and 23 cases of infiltrative cystitis.

The author summarizes the results in tabular form. Maximum period of observation was only 27 months. Radiation dosage is mentioned but the details of calculation are not given. Fundamental problems of intracavitary radiation inherent in inadequate depth of penetration are not brought out.

—*Rudolf Oppenheimer, M.D.*

GENITAL ORGANS

Tuberculosis of the Prostate and Seminal Vesicles. ANDREW SPORER and GORDON OPPENHEIMER. *J. Urol.*, Balt., 1957, 78: 278.

THE AUTHORS present an excellent résumé of the theory and practice of urology in relation to tuberculosis of the genitourinary tract. It is their feeling that the recently acquired antituberculous medications will not affect the incidence of genitourinary disease for another 10 years or so, as early hematogenous spread is the usual cause of this condition. The involvement of the genital tract with tuberculosis may be by any of five pathways:

1. Primary infection per urethrum
2. Direct extension from the neighboring organs
3. Descending urinary tract infection
4. Lymphatic spread
5. Early and late hematogenous dissemination

Generally, the genital tract infection is accounted for on the basis of early or late hematogenous spread. If local resistance is good in the prostate, the infection is held to the interstitial stage and fibrosis is the result. Sometimes calcification results as well.

If resistance is inadequate locally, caseation and abscess formation may result. In spite of the healing tendency in tuberculosis, occasionally the entire prostate and seminal vesicles can be destroyed in spite of treatment.

Clinical recognition of genital tuberculosis is very difficult and in one series diagnosis was made in only 18 per cent of the cases. The symptoms of cystitis are usual: generally frequency, urgency, and dysuria of great severity. The diagnosis rests on actual recognition of Koch's bacillus, either in bladder biopsies or concentrated urines.

Chemotherapy with streptomycin, dyhydrostreptomycin, isoniazid, and para-aminosalicylic acid has proved effective in the few cases reported. Twenty-three of 25 cases of prostatic tuberculosis were asymptomatic. The mode of action of these drugs is not known, but it is known that isoniazid can penetrate even caseous lesions which para-aminosalicylic acid and streptomycin cannot touch. The natural resistance of the body is of utmost importance in any antituberculosis therapy. The various reactions and toxicities are described. Since the introduction of these antituberculous therapies, no evidence of late spread from the tuberculous nodules has been observed. The optimal therapy is described as a combination of antituberculous drugs, in order better to combat development of drug resistant strains of tuberculosis. Therapy is continued from 12 to 18 months at least, and sexual abstinence is suggested for at least 6 months; 6 months of rest is also recommended.

The prognosis for complete recovery is good in early cases, while late cases heal with fibrosis and walling off of the affected areas. Medical management is thought to be satisfactory in the great majority of cases. —*John R. Herman, M.D.*

Serum Prostatic Acid Phosphatase Levels in Patients with Carcinoma of the Prostate. E. R. Nobles Jr., W. S. Kerr Jr., C. H. Dutoit, and G. M. Rourke. *J. Am. M. Ass.*, 1957, 164: 2020.

Since the original investigation of Gutman and Gutman in 1938, the total serum acid phosphatase level has been a useful guide in the diagnosis of prostatic cancer. Further specificity was given to this enzyme system when Abul-Fadl and King demonstrated a distinct difference between the acid phosphatase of prostatic origin and that produced by the liver, spleen, and red blood cells. At present it is well established that there is an elevation of the serum acid phosphatase level in about 80 per cent of the patients with untreated metastatic carcinoma of the prostate, and this elevation is a reflection of the increased level of the prostatic acid phosphatase.

From an extensive study by Cline and his coworkers it was apparent that elevation of the prostatic acid phosphatase level above 0.7 units per 100 c.c. showed a high degree of correlation with prostatic cancer. It was also apparent, however, that there was considerable interference from false-positive values, in the order of 5 to 8 per cent in patients with benign prostatic hypertrophy and up to 10 per cent in a group without malignant disease. Moreover, these workers reported finding elevations above 1.5 units per 100 c.c. only in prostatic carcinoma. With the refinement of acid phosphatase determinations and the subdivision of the level into serum and prostatic fractions, it was originally hoped that the use of this more sensitive method would permit earlier diagnosis of prostatic carcinoma.

Fishman and his associates reported that patients with localized prostatic cancer showed an elevated prostatic fraction in the presence of a normal total serum acid phosphatase level. That such elevations may be the exception rather than the rule was presaged in the literature much earlier when Woodward found that tissue extracts of prostatic carcinoma contained considerably less acid phosphatase than normal gland tissue. In view of this, it would be difficult to postulate the presence of an elevated prostatic acid phosphatase level in all cases of minimal carcinoma. It has been held that the prostatic fraction provides a more sensitive index of prostatic cancer activity than does the total serum level in patients on hormonal therapy and, therefore, is of superior clinical importance.

In an effort to determine the definite merit in prostatic acid phosphatase determinations, the present study was undertaken. The prostatic acid phosphatase level was evaluated, first, in its role per se as a diagnostic test for cancer, second, in its function in detecting local as opposed to metastatic disease, and, third, in its superior significance over the total level in the long term management of patients with prostatic cancer. With these questions in mind, 88 patients, including 79 with carcinoma of the prostate have been studied. The records of the patients for this study were taken from the Urologic Service of the Massachusetts General Hospital, Boston, during the years 1954 to 1956. The method of determining the total and prostatic acid phosphatase levels used was that described by Fishman and Lerner. Activity was expressed as King-Armstrong units. The normal values for total and prostatic acid phosphatase remain a matter for some debate. Mathes and his coworkers stated that 3.5 units should be the maximum. The authors in this present study agreed with that figure. They have temporarily accepted the figure of 0.7 units as proposed by Cline and his coworkers as the upper limits of normal for the prostatic acid phosphatase. These normal values are not grounded in statistical evaluations. Rather, they are based upon the clinical impressions coupled with previously reported laboratory data.

The patients in this study have been divided into six groups, relating to their clinical status with regard to the extent of the carcinoma and in some cases the type of previous therapy.

The first group was composed of patients in whom the carcinoma was limited entirely to the prostate itself, without evidence of local extension or distant metastases. Only one patient in this group demonstrated an elevated prostatic acid phosphatase level of 0.8 units per 100 c.c. The levels in the others were well within normal range, and in every case the total acid phosphatase level was normal.

In group 2, either there had been invasion of the seminal vesicles, demonstrated microscopically in the specimen taken during radical perineal prostatectomy, or the clinical impression of seminal vesicle invasion with cancer had been borne out by Silverman needle biopsy of the tumor mass. Again, in this group there were no demonstrable distant metastases. Of a total of 16 patients, only one showed an elevated prostatic acid phosphatase level. None of these patients had an elevated total serum level, and the prostatic acid phosphatase levels were generally under 0.5 units per 100 c.c.

Group 3 consisted of patients who had distant soft tissue or bone metastases or who had very extensive local disease with the prostate usually fixed to the pelvic wall. None of these patients had any therapy, operative or hormonal, prior to the phosphatase determination. Each of them demonstrated an elevation of the prostatic acid phosphatase level. Two of the patients showed an elevated prostatic level with a normal total serum acid phosphatase. The degrees of the elevation of the prostatic acid phosphatase level were quite varied and did not seem related to the extent of the disease as demonstrated by x-rays. In several of the patients there was marked elevation of both the total and prostatic phosphatase levels in the presence of nodal but not bone metastases, indicating either that elevations can occur without metastasis to bone or that the metastases were too small to be demonstrated roentgenologically.

Group 4 comprised the largest single group and consisted of patients with carcinoma of the prostate who previously had hormonal therapy or orchiectomy, or both, prior to the acid phosphatase determinations. Without exception, each of these 21 patients was considered to have progressing disease even though there may have been an initial remission due to the endocrine therapy. They were hospitalized because of severe bone pain or obstructive symptoms from local recurrence. Of a total of 21 patients only 5 demonstrated elevated serum acid phosphatase levels and

each of these had a concomitant elevation of the prostatic fraction. Three of the remaining 16 had an elevated prostatic level and a normal total serum level, and the rest of the group had normal values for both. These data therefore suggest that once there is a remission due to hormonal therapy, with subsequent further progression of the disease there need not be a secondary elevation of the prostatic acid phosphatase level. The fall to normal levels is indicative of successful hormonal control of the disease, but that these levels failed to rise again in 13 of 21 patients in clinical relapse points to the inadequacy of the test in the follow-up of patients through remissions and exacerbations.

Group 5 consisted of all patients who had been treated for prostatic carcinoma by radical perineal prostatectomy at some time in the past and who had not received endocrine therapy. Eight of these patients had a recurrence of disease. Four of the patients without evidence of recurrence showed very low prostatic fractions, 0.1 units or less per 100 c.c. Four of the 8 patients with recurrence had prostatic acid phosphatase levels in the range of 0.2 to 0.5 units per 100 c.c. The data thus far suggest that an elevation of the prostatic level into this range in a patient who has undergone previous radical prostatectomy may serve as a useful danger signal indicating recurrence.

Group 6 consisted of 9 patients in whom an elevated prostatic fraction without evidence of prostatic carcinoma was found. Follow-up studies were done at intervals from one week to nearly a year. Elevations of the prostatic fraction from 0.8 to 2.5 units per 100 c.c. were encountered in patients with benign prostatic hypertrophy and other disease. These levels returned to normal in 5 of 7 patients after prostatectomy. These data confirm the suspicion that elevations of the prostatic acid phosphatase level above 0.7 units per 100 c.c. are possible in patients who do not have prostatic carcinoma, and that even elevations above the level of 1.5 units are not diagnostic of carcinoma.

Several workers have reported a decreased activity of the acid phosphatase enzyme in tissue extracts of prostatic carcinoma as compared with that in normal or hypertrophied glands. It has been proposed that the occurrence of metastasis may be associated with the breakdown of barriers that exist in the prostate itself, which prevents the escape of acid phosphatase into the circulation, and thus far our clinical evidence lends credence to this theory. Qualitative differences may exist between the acid phosphatase enzymes liberated by normal and neoplastic prostatic tissue, and the hope remains that further refinements of our present methods of determination will permit earlier detection of carcinoma. Because of the natural history of this type of carcinoma, it is possible to have apparently well localized disease associated with distant, extensive, and otherwise undetectable metastases. It has been clearly established that only about one-half of the actual instances of bone metastases can be detected by x-ray examination. The authors are of the opinion that patients with a persistent elevation of the prostatic acid phosphatase level above 0.7 units per 100 c.c., in whom the diagnosis of carcinoma has been made histologically by biopsy, should be strongly suspected of having metastases, even though clinically the disease appears to be localized. Therefore, these patients are questionable candidates for radical perineal prostatectomy, except for the purpose of palliation. —*Ray C. Johnston, M.D.*

MISCELLANEOUS

The Ultrastructure of the Human Spermatozoon. Ake Anberg. *Acta obst. gyn. scand.*, 1957, 36: Supp. 2.

The author reports a very carefully executed study of the morphology of the human spermatozoon, and probably one of the best of those which have appeared to date. It represents the results of an electron-microscopic study of spermatozoa from semen samples and from the epididymis, including some observations on the spermatid. Semen samples, previously pronounced normal upon light microscopic examination, were used. The epididymides and some testicular specimens were obtained by epididymo-orchiectomy upon patients with carcinoma of the prostate.

Two techniques were employed. In the first, fragmentation by ultrasonics was used to separate the structures. In the second, ultrathin sectioning with the ultramicrotome was done.

The techniques of fixation, imbedding, and sectioning of the specimens are described in detail.

The author discusses the great difficulty in getting clear differentiation of the anatomical structures due to artefacts and distortion caused by fixation and techniques of preparation. In fresh semen samples the structures are generally found to be poorly preserved.

This monograph is illustrated with 11 excellent line drawings and 36 superb electron photomicrographs. The magnifications are in the range of 18,000 to 122,000 times.

There is also a historical review of previous studies made on the comparative morphology of the spermatozoon.

This small volume is highly technical and should be of special interest to research workers in the field of the morphology of the spermatozoon.

—*Frederick A. Lloyd, M.D.*

Bacteremia and Shock in Urology. William H. Rattner and John J. Murphy. *J. Urol., Balt.*, 1957, 77: 875.

The authors discuss the pathogenesis and treatment of the syndrome of bacteremia, hypotension, and peripheral vascular collapse, so often encountered during and after urologic procedures, and report 3 typical cases.

The mechanisms by which infection may produce shock, as suggested by Altemeier, are probably all operative to a greater or lesser degree in individual cases. They include the action of bacteria, their toxins, and/or their dehydration products on the capillary walls, the vascular tree, central vasomotor centers or regional sympathetic ganglia, the heart, and the blood (resulting in hemolysis), in addition to the production of adrenal insufficiency by unknown mechanisms. Another theory proposes that the liver produces an excess of VDM, a vasodepressor, which leads to further tissue anoxia and inability to combat infection.

The therapeutic regimen suggested by the authors consists of:

1. Intravenous administration of blood and fluids to maintain the intracellular fluid volume.
2. Intravenous administration of broad spectrum antibiotics of which chloramphenicol has proved most effective, especially when combined with the intramuscular administration of penicillin.
3. Administration of vasopressor agents, starting with methoxamine, then phenylephrine if needed, then levarteranol if neither of the other two agents is successful.
4. Administration of cardiac glycosides if toxic myocarditis without attendant heart failure supervenes.
5. Administration of corticosteroids to improve the clinical status of the patient and to give added support to the blood pressure. —*Paul R. Leberman, M.D.*

Some Proliferative and Metaplastic Changes in Transitional Epithelium. F. R. JOHNSON. *Brit. J. Urol.*, 1957, 29: 112.

PROLIFERATIVE AND METAPLASTIC CHANGES in the transitional uroepithelium are known to give rise to subepithelial cysts, known as pyelitis, ureteritis, and cystitis cystica, epithelial crypts, submucosal masses of epithelial cells and mucus secreting epithelium known as pyelitis, ureteritis and cystitis glandularis. The close relationship of these conditions is accepted, but the mechanism of formation and the etiology are unknown and are the subjects of this paper.

In an attempt to study this problem, 20 human autopsy specimens of ureters and pelves were examined in several sections. Animal material was also studied.

Aberrancy of the epithelium was found in all specimens taken from patients over 15 years of age, either in the form of clumps of cells in the lamina propria or as crypts of epithelium protruding into the underlying connective tissue. It is suggested that the cysts of pyelitis cystica are the results of blockage of the entrance of these epithelial crypts.

In summary, the fact that transitional epithelium commonly undergoes proliferative and metaplastic changes in its normal site, that it is capable of rapid growth and cystic formation on being transplanted, and that it is capable of inducing the formation of heterotopic bone suggests that the potency of this epithelium is considerably greater than that usually attributed to it. —*John R. Herman, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Salmonella Osteomyelitis; Report of 3 Cases, 1 with Fatal Outcome and Autopsy. STANLEY D. SIMON and CAROLL M. SILVER. *J. Internat. Coll. Surgeons*, 1957, 28: 197.

BONE AND JOINT INFECTIONS due to food-poisoning Salmonellae are more uncommon than typhoid and paratyphoid infections.

Harvey reported the cases of 71 patients with infection due to Salmonella choleraesuis. Of this number, 15 had involvement of the bones and joints severe enough to demand clinical attention. In all of the cases in which death occurred, multiple involvement of the skeletal system was recorded. Goulder and his associates reported that the skeletal system is involved in 20 per cent of the cases of Salmonella choleraesuis infection in man.

Salmonella infection in man is usually one of three types: (1) gastroenteritis, varying from a mild attack to a severe type ending in death; (2) Salmonella fever, a typhoidlike febrile illness, and (3) typhoid septicemia. The symptoms and signs in individual cases depend upon the location of any abscess present.

The organism usually responsible for the third type is one belonging to the Salmonella group C, commonly the Salmonella choleraesuis. Intestinal symptoms and lesions are usually absent, and the organism is rarely recovered from the stool.

Diagnosis and identification depend upon isolation of the organism from the blood or infected area.

The statistics indicate that Salmonella choleraesuis infection in man occurs almost always in sporadic form. This is in strong contrast to observations of other types of Salmonella infection and indicates that the sources of this infection in many may not be the same as those of infection due to other members of the genus. Other organisms of the Salmonella genus are responsible for the more common type of enteritis that usually occurs in epidemic form.

Contaminated foods are not altered in appearance, taste, or odor, and the presence of such contamination can be determined only by bacterial examination. A symptom-free carrier is a source of potential danger.

The effect of chloromycetin was not striking in any of the cases. Initially, there was a good response in case 1, but subsequently the drug failed to control the infection. Terramycin was used in cases 2 and 3.

The most frequent sites of skeletal involvement seem to be the proximal end of the humerus, the distal end of the femur, and the distal end of the tibia.

On the basis of the 3 cases reported, the authors concluded that Salmonella infection of the spine might be explained as being due to metastasis or to hematogenous osteomyelitis.

The first case report was that of a 63 year old white man who became incapacitated when he suffered a fall backward in such a way as to strike his back against a machine. Following the accident on June 14, 1954, his condition gradually improved until September, 1954, when he developed severe chills, fever, and increased pain in the back. A fatal outcome eventually resulted.

Autopsy revealed a ruptured sclerotic and mycotic saccular aortic aneurysm. Degeneration and abscess formation of the disc were noted between the second and third lumbar vertebrae. Salmonella choleraesuis was cultured from this area.

The possibility was considered that the psoas abscess could have caused the aneurysm. Microscopic examination of the aneurysm revealed vascular obstruction in its wall. Serial roentgenograms further substantiated this theory. Films taken 3 weeks after the injury revealed no evidence of involvement of the lumbar portion of the spine. Subsequent roentgenograms revealed destruction of the second and third lumbar vertebrae, and one might speculate that injury to the spine caused a local lowering of resistance with the onset of hematogenous osteomyelitis, abscess formation, and erosion of the wall of the abdominal aorta (due to pressure of the abscess) with an eventually fatal outcome. —*C. Fred Goeringer, M.D.*

Orthopedic Manifestations in Neurofibromatosis. DONALD S. MILLER, ROWLIN LICHTER, and ALVIN J. HARRIS. *Q. Bull. Northwest Univ. M. School*, 1957, 31: 245.

NEUROFIBROMATOSIS or von Recklinghausen's disease presents many variable and overlapping manifestations. The tumors often have underlying osseous defects varying from mild morphologic irregularities to such malformations as scoliosis, pseudarthrosis, and gigantism of the skeleton. Sinuous bowing, cyst formation, and spontaneous fractures may occur. Carcinomatous and sarcomatous degeneration are not at all uncommon.

These lesions often give rise to a button-like protuberance of the bone termed by one of the authors as the "button sign." It is believed to be characteristic of the disease.

Reports of 6 patients demonstrating a variety of the orthopedic features of this disease are presented with photographic illustrations. Two patients revealed sarcomatous degeneration and two others demonstrated gigantism. One had pseudarthrosis and a Madelung's deformity. The last patient presented a sciatica-like neuropathy which was proved to be a spinal cord astrocytoma. Trauma and surgery are prone to activate malignant change and are to be avoided whenever possible. —*Donald C. Geist, M.D.*

Subcutaneous Ruptures of Tendons Following Indirect Trauma (Subkutane Muskel- und Sehnenrisse infolge indirekter Gewalteinwirkung). G. BLÜMEL and F. PIZA. *Klin. Med.*, Wien., 1957, 12: 297.

FROM 1934 to 1956, or in the past 22 years, 40 patients with traumatic ruptures of a tendon have been seen and treated at the first surgical clinic in Vienna. There were 34 males and 6 females. The average age

of the patients was 47.7 years. Sixteen patients had ruptures of the biceps tendon, 11 of the quadriceps, 7 of the Achilles, and 6 of other tendons.

The symptoms consisted of localized pain, weakness of the involved extremity especially when it was lifted against gravity, hematoma, and a visible subcutaneous defect in superficial tendons. In 2 patients with old ruptures of the biceps tendon a shoulder-arm pain was present due to irritation of the musculocutaneous nerve.

In young people ruptures most often occur after a sudden poorly coordinated reflex-like motion. If, however, the rupture occurs after a regular muscular contracture, pathological changes in the tissue of the tendon should be suspected. In most of the athletes in whom a ruptured Achilles tendon was found, a history of multiple small traumas could be elicited which preceded the rupture. In patients with ruptures of the biceps tendon, arthritic changes in the intertubercular sulcus have been found. Also degenerative changes within the tissue of the tendon have been made responsible for the ruptures which occurred in older people. It is interesting to note that most of the authors' patients with ruptured tendons have been of the older age group and suffered from hypertension, arteriosclerosis, diabetes, or chronic liver diseases.

In patients with ruptures of the biceps tendon the treatment consisted of primary repair. The tendon was brought under the pectoralis insertion and transfixed to the humerus. Of 16 patients 9 have returned for follow-up and all except 1 showed satisfactory end results. In 10 patients with rupture of the quadriceps tendon, rupture occurred above the patella in 6, in 1 case below the patella. Two patients had avulsion of the tibial tuberosity. In all patients primary repair was done which consisted of end-to-end suture or transfixion of the tuberosity to the tibia with wire. Five patients returned for follow-up and all showed satisfactory results.

Of 7 patients with ruptures of the Achilles tendon ruptures were complete in 4, 1 occurred only on the medial side of the tendon, and in 1 patient a partially organized hematoma was present at the time of surgery. All 7 patients were followed up and except for minor complaints showed good end results.

—George B. Wichman, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Treatment of Skin Avulsion Injuries of the Extremities. CYRIL O. INNIS. *Brit. J. Plast. Surg.*, 1957, 10: 122.

TWENTY CASES of avulsion injury of the extremities are presented. The patients are divided into two groups: those seen within a few hours of injury, and those seen for correction of ultimate necrosis of the flap which had developed after primary suture. The author expressed the opinion that excision of the primary flap in early cases followed by immediate skin grafting to close the wound is the only suitable procedure if the general condition of the patient permits. Careful débridement with excision of all undermined tissue is a necessary prerequisite to the split-skin graft which is applied to the defect.

In cases in which the primary suture failed and ultimate necrosis of the flap occurred, the best treatment was excision of the necrotic area. The bed is easily prepared by the usual local means, following which split-skin grafting is carried out. In the patient having immediate skin grafting, physiotherapy for restoring function to the extremity is begun after about 14 days.

The author recommended this treatment because it reduces the amount of deep scarring and posttraumatic edema, allows for more rapid release from the hospital, and gives better functional results.

—Einer W. Johnson, Jr., M.D.

Spinal Fusion in Tuberculous Spondylitis of the Spine (Die Spondylitis-Schienung aus dem Blickwinkel der operativen Fruebehandlung bzw. Herdausraeumung an der Wirbelsaeule). E. ALBERT. *Zschr. Orthop.*, 1957, 89: 51.

THE AUTHOR discusses the indications for posterior fusion in tuberculous spondylitis of the spine. According to him, fusion is indicated only in the healing stage of the disease, especially when bony fusion of the diseased vertebral segment does not follow conservative treatment or operative cleaning of the focus. If it is done in the destructive phase of the disease, it frequently fails to arrest the progression of the deformity and also may lead to pseudarthrosis. In cases with cold abscess or fistulous drainage, the abscess should be drained before fusion is attempted. The fistulous tracts should be excised, and only after the infection subsides should posterior fusion be done.

Early fusion immobilizes the diseased vertebral segments and in this way enhances healing of the infection. It also splints the spine and prevents progression of the deformity. By reflex dilatation of the blood vessels, it theoretically may be responsible for an increase in circulation of the diseased area. The detailed technique of the operation used by the author is described. A few case histories are presented, with the roentgenograms.

In conclusion the author states that both methods—early focal surgery and posterior spinal fusion—are valuable in achieving optimal results in the treatment of tuberculous spondylitis.

—George B. Wichman., M.D.

Shortening Osteotomy (Verkuerzungsosteotomie). HÜSAMETTIN ALTAV. *Zschr. Orthop.*, 1957, 89: 83.

THE MOST COMMON CAUSES of leg shortening are: (1) deformed fractures of the femur, (2) poliomyelitis, (3) congenital hypoplasia, and (4) growth disturbances caused by tuberculous osteomyelitis, septic inflammation of the joints, trauma, and tumors. The presence of 4 cm. shortening is an indication for correction. Often a genu recurvatum developed in the opposite leg. A great number of old hip dislocations offered a good indication for subtrochanteric shortening combined with intramedullary nailing after the antetorsion had been corrected and the head replaced. A V-shaped osteotomy is recommended. To prevent delayed union a bonegraft is used either as an onlay graft (Phemister) or multiple bone fragments are used with plaster immobilization for 4 weeks. The nail should not be removed for 12 months, although con-

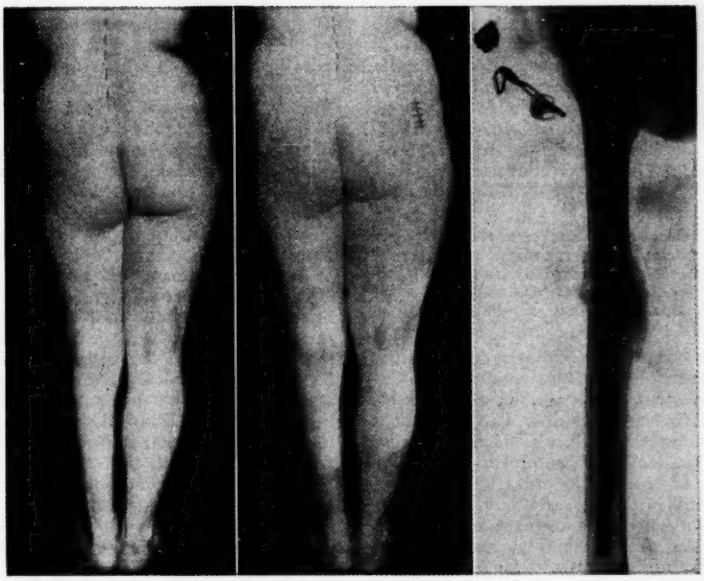

FIG. 1, 2, 3 (Altav).

solidation can be expected in 2 to 3 months. Intensive exercise therapy is necessary.

Figures 1, 2, and 3 show a good functional and anatomical result in a case of poliomyelitic shortening, pelvic obliquity, and static left convex scoliosis corrected by 3 cm. shortening and stabilized by intramedullary nailing.— *Ernest H. Bettmann, M.D.*

FRACTURES AND DISLOCATIONS

A Clinical Trial of the "Hanging Arm" Reduction of Dislocation of the Shoulder. T. J. McNAIR. *J. R. Coll. Surgeons,* Edinburgh, 1957, 3: 47.

ALTHOUGH the classical techniques for reducing anterior dislocations of the shoulder, that is the hippocratic or Kocher techniques, can be performed without anesthesia, they invariably cause pain to the conscious patient. The advantages of a simple painless technique are obvious, particularly for a busy emergency room where out-patient care is the custom. The avoidance of general anesthesia decreases the risk and simplifies the care. The "hanging arm" technique of Lacey and Crawford with slight modification has been assayed as such a painless, simple, out-patient technique.

The patient is stripped to the waist and laid face down on a couch and his injured limb is allowed to hang freely over the side for at least 10 minutes. A slim pillow placed beneath the chest and light strapping of the patient to the couch to prevent slipping off adds to the patient's comfort and relaxation.

At the end of the 10 minute period the operator, kneeling, grasps the patient's arm above the elbow and applies steady downward traction. Then slowly and gently he rotates it externally. Pain must be scrupulously avoided as pain negates relaxation and thereby impairs reduction. Moderate flexion and abduction are slowly accomplished. The operator's other hand is gently placed under the patient's upper arm and reduction completed by lifting the head of the humerus out and upward over the glenoid rim.

Of 100 patients so managed at the Surgical Outpatient Department of the Royal Infirmary of Edinburgh, reduction was accomplished successfully and painlessly in 90. Prior to reduction vascular and nerve lesions were excluded and roentgenologic confirmation of the diagnosis was obtained. The average time for reduction was 20 minutes. Of the 10 failures, 7 were attributable to inability to obtain satisfactory relaxation. Some patients were simply too intoxicated.

Since the "hanging arm" method is so often successful, it seems worthy of preliminary trial. If it fails, general anesthesia can always be employed.

—*Everett Shocket, M.D.*

Dislocation of the Head of the Fibula. L. H. MULLER. *Med. Proc.,* 1957, 3: 336.

THE AUTHOR presents 2 cases of dislocation of the head of the fibula. The head of the fibula may be dislocated anteriorly, posteriorly, or proximally, and occasionally both the proximal and the distal ends of the fibula are dislocated. The patient usually complains of pain in the outer aspect of the knee joint and passive movement of the ankle joint causes pain in the region of the head of the fibula. In cases of posterior dislocation the common peroneal nerve may be injured. In both cases, closed reduction was not successful. In the first case of anterior dislocation of the head of the fibula an open

reduction revealed that the posterior edge of the head of the fibula was resting on the ridge of bone projected by the tibia. Reduction was then accomplished quite easily. In the second case of a posterior dislocation of the head of the fibula, an open reduction was done and the head of the fibula was reduced with a characteristic loud snapping noise. The reduction remained stable and the results were satisfactory.

—*George I. Reiss, M.D.*

End Results of Treatment of Supracondylar Fractures in Children (Behandlungsergebnisse nach suprakondylaeren Oberarmbruechen bei Kindern mit besonderer Beruecksichtigung des Schicksals von Fehlstellungen). G. RAVANELLI and K. PRINSTL. *Zschr. Orthop.*, 1957, 89: 102.

SUPRACONDYLAR FRACTURES in children consist in the following deformities: shortening, rotation, angulation, and displacement of the parallel axis. The elbow is frequently in varus position. The anatomical reduction of fractures is difficult since in young children skeletal ossification is incomplete. The author superimposes the anteroposterior and lateral views on the roentgenograms of the opposite side and in this way estimates the amount of displacement. In old cases with a healed fracture the authors estimate Bauman's angle (the line drawn through the metaphysis adjacent to the capitulum which intersects the second line along the main axis of the humerus).

One hundred sixteen patients with supracondylar fractures were seen from June 1946 to June 1955; 62 per cent were males and 38 per cent were females. In most of the cases the left arm was involved. The youngest patient was 2 years old, the oldest 14. All injuries were divided into 3 groups: in group 1 there was no visible displacement, in group 2 mild displacement, and in group 3 severe displacement and deformity. The patients in group 1 were not examined. Patients in group 2 and 3 had mostly hyperextension fractures. Out of 77 patients in groups 2 and 3 only 65 appeared for re-examination. In all of them the original roentgenograms were available for comparison. The average amount of time that elapsed following the accident was 4 years; the longest was 9 years, the shortest 7 months.

The average duration of treatment was 4 weeks. Thirty-three cases were reduced under general anesthesia, and in 32 cases immobilization was done without reduction. In the total series of 65 cases the following complications were seen: in 3 there was median nerve paresis, in 3 radial nerve paresis, in 4 fractures of the distal forearm, 1 fracture of the proximal radius, 1 fracture of the pelvis and 1 of the humerus on the same side. In many of the patients in group 3 the radial pulse was not palpable, but returned as soon as reduction was accomplished. In no case was myositis ossificans or Volkman's contracture observed.

Out of 66 cases, 33 showed changes in the carrying angle. The worst one healed with 5 degrees of cubitus varus as compared to 20 degrees of cubitus valgus on the opposite side. Twenty-three of these cases belonged to group 3 and only 10 to the group 2 fractures. In 25 of the group 2 fractures the cubitus valgus has increased. In some cases the carrying angle did not change and remained the same as on the healthy side. It appears that during the accident a valgus position of the distal fragment with posterior angulation occurs first and then when the trauma is continued, shortening, varus, and parallel displacement of the fragment occurs. If at the time of reduction the deviation of the axis or the angulation is not corrected, a change of carrying angle of the elbow will result. Parallel displacement occurred in 15 cases toward the outside, in 12 cases toward the inside, and in 4 cases posteriorly. In all of the cases which have been seen several years after the accident the soft tissue contractures have disappeared. When posterior angulation of the distal fragment was present, it varied from 7 to 20 degrees. In patients with 20 degrees of posterior angulation the elbows could be hyperextended, and in several patients the range of motion on the involved side was 210 to 55 degrees as compared with 190 to 55 degrees on the normal side. Parallel displacement was corrected with a callus and a spur of bone, which, however, disappeared in later life. In cases in which parallel displacement was associated with rotation of the distal fragment, the spur did not disappear in later life and was responsible for limitation of flexion. In 31 patients the injured epiphysis showed advanced growth as compared with the healthy side and in 18 cases it closed prematurely. In 8 cases the olecranon fossa was reabsorbed. The muscle power of the muscles of the forearm was normal in all cases.

Subjectively 51 patients were asymptomatic; 14 who had marked deformity of the elbow complained of muscular weakness, limitation of motion, diminished power of the grip and arthritic pains. Neurologic weakness, which was present in 6 patients at the beginning of treatment, disappeared spontaneously at a later date. In conclusion the authors state that a good reduction of supracondylar fractures in children which corrects angulation, shortening, and rotation of the distal fragments is imperative for good functional end results.

—*George B. Wichman, M.D.*

Radial Palsy in Closed Fractures of the Humeral Shaft (Les paralysies radiales dans les fractures fermées de la diaphyse humérale). PIERRE WERTHEIMER and JACQUES AVET. *Sem. hôp. Paris, Ann. chir.*, 1957, 11: 675.

THE RADIAL NERVE lies in very close contact with the dorsal surface of the shaft of the humerus and is accompanied by the brachial artery; this may be the cause of hematomas around the nerve after injuries in this region.

Contusion, distention, complete section, slow compression, and damage to the nerve after open reduction for fractures of the humeral shaft are different possible pathologic conditions. Statistically a surgical procedure was the immediate cause of 6 of the 19 cases of paralysis studied, while in 2 other cases surgical intervention had certainly favored the occurrence of the paralysis.

There are cases with early paralysis and others in which the onset of paralysis is late. To make a prognosis based on clinical signs is almost impossible.

The treatment is extensively discussed. The authors do not believe that immediate operation is justified in early paralysis. Only after 4 or 5 weeks should the surgeon intervene if spontaneous improvement does not occur. In the meantime the fracture will be healing.

If, however, an open reduction is necessary to treat the fracture, the nerve should be explored and transposed.

In late paralysis the nerve must be explored surgically without delay. The nerve is freed, sometimes partially excised, and resutured after shortening of the humeral shaft. In paralysis following open reductions it is wise to carry out exploration of the nerve.

—*J. C. Mulier, M.D.*

Open Reduction of Bennett's Fracture. F. P. DEWAR and W. R. HARRIS. *Canad. J. Surg.*, 1957, 1: 33.

THE AUTHORS review the historical data of Bennett's fracture briefly. They have described previous procedures and now are describing one of their own methods.

Briefly, their method consists of a short curvilinear incision at the base of the thenar eminence and over the abductor pollicis longus tendon. The thenar muscles are retracted medially to expose the joint capsule. The latter is opened; the avulsed fragment is reduced and temporarily held with a towel clamp. Two parallel drill holes are made through the base of the metacarpal and broken fragment. The retention of fragments is achieved with No. 24 stainless wire threaded through holes and knotted. The wound is closed. A firm flannelette dressing is applied and early movements are recommended.

The authors report 8 cases treated by this method in the Division of Orthopaedic Surgery at the Toronto General Hospital. Seven of the small series presented excellent results and in one case dislocation of the reduced fragment recurred.

—*Samuel L. Governale, M.D.*

A Rare Case of Carpal Fracture-Dislocation (Un cas rare de fracture-luxation du carpe). R. VAN CAUWENBERGHE. *Acta orthop. belg.*, 1957, 23: 79.

THE AUTHOR describes a case of carpal fracture in which semilunar dislocation was accompanied by fracture through the scaphoid and the capitate. The proximal fragment of the latter bone was rotated through an angle of 180 degrees. Only 3 cases with similar lesions (as shown by roentgenography) were found in the literature (Blundell Jones and Fenton). In the latter cases reduction of the semilunar dislocation had probably occurred spontaneously and there had been no actual proof of the dislocation. The author, however, examined the patient before reduction of the luxation. After the reduction the proximal fragment of the capitate remained rotated so that its articular surface was opposed to the fractured surface of the distal fragment.

According to the author, the best treatment (if the fracture of the capitate has been recognized immediately) would be to remove the proximal fragment and to immobilize the wrist to obtain fusion of the scaphoid.

—*J. C. Mulier, M.D.*

Treatment of Grade 4 Fracture-Dislocation of the Hip; a Review. GARRETT PIPKIN. *J. Bone Surg.*, 1957, 39-B: 1027.

THIS ARTICLE is a review of grade 4 fracture-dislocation of the hip. This condition is defined as a dislocation of the hip combined with a fracture of the head or neck of the femur. The material presented consists of 25 such hip injuries in 24 patients and is the pooled experience of many orthopedic surgeons.

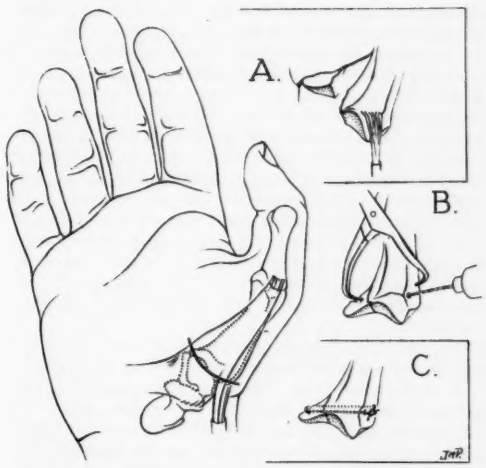

FIG. 1 (Dewar, Harris). Method of introducing a stainless steel wire suture for internal fixation.

Four types of grade 4 fracture-dislocation of the hip are recognized. In type 1 there is dislocation with fracture of the femoral head caudal to the fovea capitis femoris, in type 2 there is dislocation with fracture of the femoral head cephalad to the fovea capitis femoris, in type 3 a type 1 or type 2 injury is associated with a fracture of the femoral neck, and in type 4 a type 1 or type 2 injury is associated with a fracture of the acetabular rim.

In the treatment of types 1 and 2 fracture-dislocations a distinction is made between the fractures which occur above and those which occur below the fovea capitis femoris. If the ligamentum teres remains attached to the lesser fragment the fragment may be rotated. Unless derotation can be accomplished closed reduction will not be successful. The reduction of the dislocation must be prompt. Good union will be obtained in types 1 and 2 fractures if prompt closed reduction is accomplished and the limb is immobilized for several months in traction or in plaster. The reduction of the femoral head fracture need not be anatomically accurate. The lesser fragment is a part of a sphere so that a certain amount of rotation is allowable without producing complete incongruity of the articular surface of the femur. Open reduction in types 1 and 2 fractures is indicated when there is an obstructive fragment, when one is unable to obtain or maintain reduction of either the dislocation or the fracture, and when the fractured bone is comminuted. There is a higher percentage of failures following open operation than there is after a successful closed reduction. Open operation may be a combined open reduction of both the fracture and the dislocation with or without internal fixation of the fracture, or may combine excision of the lesser fragment with either open or closed reduction of the dislocation. Lastly,

various salvage procedures may be necessary. When there is comminution of the fracture the patient may be managed by immediate closed reduction of the dislocation and excision of the lesser fracture fragments at a later date. In 3 of the cases of type 1 and 2 fracture-dislocations fibrous or bony ankylosis developed. In all of these cases some form of open operation had been performed and resulted in early useful hip motion which gradually decreased over the next few years as periarticular calcification appeared. In spite of this a slight amount of useful motion remained and the hips were relatively free from pain and relatively tolerant to weightbearing. It is felt, therefore, that increasing periarticular calcification and decreasing hip motion are not indications for further surgery.

In type 3 fracture-dislocations it is best to manage the fracture of the femoral neck with a hip nailing. This then reduces the problem to the management of a type 1 or 2 injury, that is, to the treatment of the dislocation and the fracture of the femoral head. These latter two abnormalities can be managed as indicated for types 1 and 2 injuries. In a type 4 fracture-dislocation, that is, where there is an injury of the acetabular rim, the fracture of the femoral head in the dislocation of the hip is treated according to the methods outlined under the types 1 and 2 injuries. The fracture of the acetabular rim is treated in the same manner that would be used in the grade 1, 2, or 3 fracture-dislocation of the hip, that is, those grades in which there is dislocation of the hip and fracture of the acetabular margin but no injury to the femoral head or neck. When necessary the stability of the acetabular margin should be restored by open operation.

Three of the patients in this series were considered to have irreparable hip injury at the time of the initial trauma. In one case a Whitman reconstruction was performed on the second day after the injury. In the remaining 2 cases endoprostheses were inserted soon after the injury.

The complications encountered in this series included surgical fracture of the femoral neck during attempted closed reduction, fatigue fracture of the femoral neck after successful open reduction, avascular necrosis, incongruity of the articular surfaces and traumatic arthritis, myositis ossificans, periarticular calcification, peroneal nerve paralysis, infection, and fibrous or bony ankylosis.

None of the results in this series are classified as excellent. Nine cases were classified as presenting a good result. One of the good results occurred in a type 3 fracture-dislocation and one in a type 4. The remainder occurred in types 1 and 2. One patient had a fair result. He had a type 2 fracture treated by closed reduction. Twelve patients were classified as having a serviceable hip following treatment. Three of these patients had a type 3 fracture-dislocation, one had a type 4 injury, and the remainder had types 1 and 2. Two results were classified as failures. One of these occurred in type 1 and the other in a type 4 injury. Fifteen of the patients were treated by open surgery and various types of procedures were carried out. The remaining 10 were treated by closed reduction initially. In 3 of these 10 secondary surgery was carried out; it consisted of delayed excision of the lesser fragment in one case and the insertion of an endoprosthesis as the final procedure in 2 cases. It is thought that no one surgeon will be likely to accumulate sufficient experience within his lifetime to understand completely all of the facets of a grade 4 fracture-dislocation of the hip. Consequently a review based upon the experience of many surgeons will give a clearer picture of the prognosis in this disease.

—Robert D. Larsen, M.D.

The Proximal End of the Femur; Investigations with Special Reference to the Etiology of Femoral Neck Fractures. STIG BACKMAN. *Acta radiol.*, Stockh., 1957, Suppl. 146.

THIS 166 PAGE MONOGRAPH deals with anatomic and roentgenographic aspects of the proximal end of the femur as well as theoretical stress calculations of the femoral neck and work on the experimental production of fractures of the femoral neck. Complete perusal of the interesting devices for measuring stress of the femoral neck is necessary for thorough understanding. Considerable space is devoted to theoretical stress calculations and the mathematical computations of the force necessary to produce fractures.

It is shown that a plane of symmetry referred to as the "principal plane" can be projected in the femoral head and neck, which divides this part of the femur into two symmetrical halves. The shape and architecture of the femoral head and neck suggest that they are adapted for maximal loads in a direction coinciding with the principal plane. The author stated that fractures of the hip are not due to a fall per se, but that particularly medial fractures are due to rotary movement of the femur about its axis or principal plane.

As practical conclusions and applications of his theoretical stress calculations, the author concluded that the femoral neck is weakest at the load directions associated with a fall on the hip and these facts are further carried over into the use of proper prostheses which should be designed and positioned so that their direction coincides with the plane of the main load or force.

No definite correlation was found between this type of fracture or definite types and the direction of forces applied with one exception. Medial fractures could be readily duplicated by reproducing the violence that a fall on the hip constitutes.

The author also concluded that a fall on the hip is a consequence and not a cause of medial fractures.

—Einer W. Johnson, Jr., M.D.

ORTHOPEDICS IN GENERAL

The Effect of Continuous Administration of Cortisone and Its Withdrawal on Bone. ELSDON STOREY. *Austral. N. Zealand J. Surg.*, 1957, 27: 19.

THIS STUDY is concerned with the effect of cortisone on bones in the rabbit, and the changes following the withdrawal of cortisone.

Rabbits were the experimental animals used and were injected with 25 mgm. of cortisone per day. Histologic sections of bone were obtained at regular intervals. After the administration of cortisone the cranial vault was studied, and it was concluded that

sutural connective tissue is very sparse and bone edges have partly resorbed.

In a study of the premaxilla there is resorption of the serrations of sutures which almost separates them from the adjoining premaxillary bone while the connective tissue connecting the two bones is sparse.

In the femur the most significant changes are at the growing epiphyseal cartilage. On the periosteal surface of the shaft there is little new bone formation. In all bones, upon the withdrawal of cortisone, there is a change from the process of resorption to that of deposition of bone.

Seven figures are included in the article. The administration of ACTH produces no observable effect on the bone of either the skull or premaxillae.

It is quite possible that osteoporosis may be produced in more than one way. The administration of ACTH increases the level of citric acid while cortisone decreases it.

In the rat, as in the rabbit, following the administration of ACTH there is a slowing down of epiphysial proliferation and osteogenesis. The adrenal cortex is known to produce more than one hormone, and possible antagonists to the action of cortisone must be borne in mind. The withdrawal of cortisone is followed by rapid bone formation in the areas where resorption of bone has previously occurred. Some bone conditions may be due to hormonal disturbances. The administration of cortisone in the rabbit is associated with an immediate resorption of bone and inhibition of new bone growth so that all bones and all bone trabeculae are grossly thinner than normal.

The epiphysial cartilage also is resorbed partially under the influence of cortisone while no new growth of bone is observed. With ACTH there is only a slowing of cartilaginous proliferation and osteogenesis. ACTH does not have the same effect on bone as does cortisone; neither skull, vertebrae, nor femur show evidence of increased resorption.

Following the withdrawal of cortisone, new bone forms where previously it was being removed. It is emphasized that the new bone formation after cortisone withdrawal is greater in amount than would have been expected in a simple replacement of resorbed bone. —*Richard J. Bennett, Jr., M.D.*

Arthrogryposis Multiplex Congenita or Congenital Muscular Contractures Deforming and Dislocating the Members (Contractures musculaires congénitales déformantes et luxantes des membres arthrogryposis multiplex congenita). J. P. MICHAIL, S. THÉODOROU, and J. MATSOUKAS. *Rev. chir. orthop., Par.*, 1957, 43: 38.

ALTHOUGH THE CLINICAL SYMPTOMS of arthrogryposis multiplex congenita are very well defined, the etiology remains obscure. The different etiological hypotheses are very well summarized by the authors and include the hereditary, articular, muscular, neurogenic (anterior horn cells), mechanical (intrauterine pressures), inflammatory (intrauterine or general viral infections of the mother), and vascular theories.

There are two facts which make it difficult to establish the etiology with certainty: the infants are born with the complete syndrome, intermediate stages are lacking, and some of the extremities are intact while others are seriously affected by the disease, but none are only partially affected. Intermediate stages and partially affected limbs would make study easier.

In one case the authors found a confirmation of the hereditary theory. A child was affected exactly in the same way as his father. They both presented a slight involvement of the upper extremities and severe involvement of the lower ones. Two other patients presented a diminished muscle tonus instead of contractures. Autopsy findings in another case seemed to prove that the number of anterior horn cells was diminished in the medullar enlargements.

From their clinical and histological observations the authors conclude that, although heredity seems to be the etiological factor, the muscular contractures are responsible for the joint stiffness and dislocations.

The most important primary finding, the diminished number of anterior horn cells, may be the cause of the muscular contractures.

The results of surgical, orthopedic or physical therapy are often ameliorative, even though the condition is exceptionally severe. —*J. C. Mulier, M.D.*

Madelung's Deformity in Twins (Madelungsche Deformitaet bei Zwillingen). P. M. JANTZEN. *Zschr. Orthop.*, 1957, 89: 121.

IN 1878 MADELUNG described the deformity named after him as "a spontaneous subluxation of the hand anteriorly." He described the deformity clearly and placed it in a group of growth disturbances which included flatfoot, genu valgum adolescentium, and scoliosis. Since that time many symptomatic club hands have been confused with the true Madelung deformity. It has now become clear that the deformity is an endogenous malformation which is due to premature closing of the ulnar portion of the distal radial epiphysis. There is a familial occurrence in 40 to 50 per cent of the cases. The deformity occurs bilaterally in 50 to 80 per cent of the cases. The ratio of males to females afflicted with the deformity is four to one. There is a frequent combination with other malformations, particularly defects in the carpal bones and in the first finger rays.

Typically, the deformity begins to appear in the first half of the second decade. It progresses gradually and may be painful during periods of accelerated growth. The inclination of the distal radial joint surface is increased toward the volar and ulnar sides. The hand comes to lie in a bayonet position. Dorsal flexion is increased and volar flexion is decreased. Ulnar and radial abduction as well as supination may be limited. There may be a compensatory dorsal deviation of the interphalangeal joints. The head of the ulna is subluxated dorsally and the radius is distorted so that it has a convexity which points in the radial and dorsal directions.

Madelung's deformity has been described in twins only once before (Poliak). In the present example the deformity was found in identical twins. In one of the sisters the deformity was less marked than in the other. In the mother there was a first stage Madelung deformity.

The mother showed a unilateral prominence of the ulnar head and limitation of dorsiflexion of the wrist to 140 degrees. In the lateral roentgenogram there

was a slight increase in the inclination of the distal radial joint surface in the volar direction. In one of the twin sisters the deformity was manifested more clearly on the right side than on the left. On the right side the dorsiflexion was more strongly limited; on the left the radial abduction was more strongly limited. In the anteroposterior roentgenogram the left radial joint surface showed the typical changes more clearly than the right one. It was strongly inclined toward the ulnar side, and had completely lost its normal form. In the other sister, now 16 years old, the mother first discovered the deformity in her tenth year. In this sister the deformity was bilateral. There was 10 degrees of dorsal flexion, 90 degrees of volar flexion, and 45 degrees of ulnar abduction in the wrist joints. Radial abduction was possible only to the middle position. The typical deformities were present in the roentgenograms.

In the brother there was a shortening of the fourth right metacarpal which was regarded as an isolated expression of epiphysial disturbance.

This family was regarded as a series showing a transition from almost normal hand joints, as seen in the mother, through the less severe stages of Madelung's deformity, as shown in the left hand of the first sister, to the most severe stages of the disease, as seen in the second sister. These findings correspond with the opinion of Schenk that there is a gradual transition from the normal radius, to the "console" radius, to the Madelung deformity. —*Robert D. Larsen, M.D.*

Club Thumb in Abduction—Extension and Associated Deformities (Pouce bot arqué en forte abduction-extension et autres symptômes concomitants). J. MICHAIL, J. MATSOUKAS, and S. THÉODOROU. *Rev. chir. orthop.*, Par., 1957, 43: 142.

THE AUTHORS describe a bilateral deformity of the thumb in a 7 year old boy. They were unable to find a similar case in the world literature.

The distal phalanx of the thumb is in a position of extension-abduction on the proximal phalanx, which makes it impossible for the patient to touch the fingertips with his thumb.

The proximal phalanx is shortened and deformed. Roentgenograms show all the other fingers to be normal. The proximal phalanx is triangular in shape, and its distal epiphysis is missing. There is a dislocation of the distal phalanx which articulates with one side of the proximal phalanx. The head of the first metacarpal is normal.

There are other concomitant symptoms. The boy is mentally deficient and physically underdeveloped. He has a comical face, a long Cyrano-type nose, muscular hypotonia with platypodia, funnel-chest, cryptorchidism, as well as spindle legs.

—*J. C. Mulier, M.D.*

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Radiologic Aspects of Operable Heart Disease; the Hazards of Retrograde Thoracic Aortography. HERBERT L. ABRAMS. *Radiology*, 1957, 68: 812.

AN ATTEMPT has been made to estimate the dangers involved in retrograde thoracic aortography so that its risks can be weighed against its values. Questionnaires were sent to 170 institutions in the United States, Canada, England, France, Sweden, Denmark, Germany, and South America. A response was received from 104 institutions. Twenty-nine deaths were reported in a series of 1,706 thoracic aortographic examinations. When a 70 per cent concentration of the medium was employed the mortality rate was eight times higher than with 30 to 35 per cent concentrations. Retrograde carotid injection was associated with a higher mortality than brachial or catheter injections. No deaths followed the use of retrograde brachial aortography with 30 to 35 per cent concentrations of media. Most of the deaths and severe reactions appear to be associated with cerebral damage. Marked reactions of the kidney were also noted, as were cardiac and respiratory disturbances.

The following recommendations were made to minimize the risks of retrograde thoracic aortography:

1. Carotid compression should be routinely employed during the injection period.
2. In infants and children under four years, 70 per cent concentrations should not be employed. For most adults, a 70 per cent concentration is required but it should be used cautiously.
3. A dosage scale should be constructed in each institution based on the smallest volume consistent with a satisfactory examination.
4. Multiple injections should be used only when absolutely necessary.
5. Direct counter-current injection through the carotid artery appears to increase the risk significantly and should be discontinued.
6. A general anesthesia increases the hazard. All procedures should be done under local anesthesia.
7. It is desirable to use an opaque catheter so that its position may be carefully checked prior to injection.
8. All patients should be adequately hydrated prior to aortography.
9. Continuous electrocardiography is desirable.
10. Continuity, should be re-established whenever possible in arteries which have been cannulated.
11. Medicolegal factors dictate the routine employment of sensitivity tests.
12. Severe acute or chronic renal or cerebral disease is a contraindication. A history of allergy warrants caution.

"Reasonable familiarity with the potential risk is mandatory if thoracic aortography is to continue to serve a useful function."

—*Robert A. Nabatoff, M.D.*

A Survey of Complications of Abdominal Aortography. JOHN G. MCAFEE. *Radiology*, 1957, 68: 825.

IN ORDER TO obtain data concerning the number and type of complications following abdominal aortography a questionnaire was sent to 450 hospital radiologists and urologists in the United States. A reply was received from 301. A survey of 13,207 abdominal aortograms revealed 37 deaths and 98 serious complications. Renal damage from the contrast medium was the most important complication, usually resulting from excessive injections, direct renal artery injections, or injections in patients with high aortic obstruction. Neurologic damage appeared to be an important hazard, sometimes resulting in prolonged morbidity. The danger appeared to be increased by the use of spinal or general anesthesia, by excessive injections of the medium, and by the proximity of the needle tip to the major anterior radicular artery, usually at the second lumbar level. Less frequent complications include hemorrhage from the site of the puncture and cardiovascular, gastrointestinal, and general anesthetic disturbances. The over-all complication rate was 1.02 per cent and the mortality rate 0.28 per cent.

Although the complications associated with aortography can never be entirely eliminated, certain measures are suggested to minimize their frequency.

1. A test film after injection of 5 c.c. of the medium, with the aortic needle in place, should be performed routinely to prevent direct injection into the renal arteries or other aortic branches.
2. The aortic needle should be inserted at a high level, well above that of the second lumbar level. If examination of the kidneys or upper aorta is not required, insertion should be well below the level of the renal arteries.
3. Local anesthesia is indicated in most patients to minimize the danger of neurologic damage.
4. Abdominal compression or the two-needle aortogram technique should be avoided.
5. Excessive amounts of contrast medium (over 30 c.c.) should not be used, and as few injections should be made as possible.
6. The least toxic contrast medium should be used.
7. In patients with high aortic obstruction 12 to 15 c.c. of the medium and a single injection is usually satisfactory.
8. Direct puncture of an aortic aneurysm should be avoided.
9. A routine 20 minute pyelogram should be obtained to detect complications.
10. If severe reactions occur, they may respond to intravenous preparations of cortisone.

—*Robert A. Nabatoff, M.D.*

Coarctation of the Aorta in Infants and Children. EDWARD A. SMELOFF, S. RICHARD BAUERSFELD, and EDWARD M. KENT. *Ann. Surg.*, 1957, 146: 450.

SIXTY cases of coarctation of the aorta in infants and children were seen at the Children's Hospital, Pitts-

burgh, between March, 1952 and March, 1957. There were 37 infants less than 19 months old and 31 were 12 months old or less. Of the children 23 were from 3 to 14 years of age. All are living; 8 were operated upon and had a resection of the coarctation and end-to-end anastomosis with excellent results; 3 of these children had an associated patent ductus arteriosus. Seven were operated upon at the optimal time, at 11 to 14 years of age, and 1 at 7 years because of an associated interventricular septal defect. In the infant group, 17 died, a mortality of 46 per cent. Sixteen of the 17 fatal cases were less than 12 months old, and all with one exception had at some time been in congestive failure. Six infants were operated upon, 1 with hypothermia, and all died. Four died of cardiac arrest during operation and 1 of congestive heart failure 1 day postoperatively. Four of these 6 cases had a preductal coarctation; all had other associated anomalies. Eleven died without surgery; 1 who died of cardiac arrest after an aortogram showed multiple defects at autopsy, another died of ventricular fibrillation after cardiac catheterization, a third died of renal failure, and 7 died as a result of congestive heart failure. The coarctations in the patients who were subjected to autopsy were located as follows: 12 preductal, 2 preligamentous, 2 postductal, and 1 postligamentous. Twelve patients had associated intracardiac defects.

The problem of coarctation in infancy lies in determining which cases should be operated on in infancy and which may be safely deferred. Postductal cases usually do well and operation can be postponed. The patients who die in infancy with coarctation are those with right ventricular hypertrophy, congestive heart failure and cardiomegaly, and, the authors suspect, with pulmonary hypertension. All the patients who died had either a patent ductus arteriosus or an associated intracardiac anomaly. The treatment of pulmonary hypertension has been disappointing to date, and if it is responsible for cardiac arrest during surgery, hypothermia is not the answer. Mustard and others have operated successfully on preductal lesions, but at very early ages ranging from 12 days to 5 months. The authors conclude that infants with evidence of right axis deviation, right ventricular hypertrophy, and past or present congestive failure are those for whom surgery should be considered, and since 5 infants with congestive failure and right ventricular hypertrophy died with surgically correctible lesions, perhaps surgery should be done in all these cases. —*Albert M. Schwartz, M.D.*

Surgical Treatment of Atherosclerotic Occlusion of the Internal Carotid Artery. CHAMP LYONS and GARBER GALBRAITH. *Ann. Surg.*, 1957, 146: 487.

THROMBOSIS OF THE INTERNAL CAROTID ARTERY in the neck has emerged as a clinical entity within the past five years. The neurologic manifestations are those of a frontal lobe syndrome; it affects men four times as frequently as women in the age group of 30 to 60 years. The most frequent site of the obstructing plaque is in the region of the carotid bifurcation at or above the carotid sinus. Significant cerebral infarction may occur in these cases with prolonged hypotension or faulty collaterals. The latter is usually due to complete or incomplete obstruction of the contralateral carotid or the vertebral arteries, resulting in the so-called caroticovertebral syndrome. Earlier methods of treatment were not successful, including novocain block of cervical sympathetic ganglions, cervical sympathectomy, denervation of the contralateral carotid sinus, thromboendarterectomy, carotid-jugular fistula, and anticoagulants. The authors mention the early operative cases with variable results and indicate the importance of the ipsilateral external carotid as a source of collateral blood flow when the internal carotid is obstructed. By using a bypass graft from the subclavian to the distally patent internal carotid in segmental occlusions, they avoided the use of hypothermia and the attendant risks.

The patients selected for operation had symptoms without evidence of major infarction, absence of major electroencephalographic changes, and an occlusion of the internal carotid artery demonstrated by arteriography. The operative procedure is described and illustrated. Six cases are presented with 5 successful subclavian to internal carotid shunts; four of the patients survive without significant neurologic signs or symptoms. The authors recommend more frequent cerebral arteriography in patients with the "little stroke" syndrome and signs of cerebral claudication before major infarction occurs so that exploration may be done. —*Albert N. Schwartz, M.D.*

Teflon Fabric Grafts in Growing Pigs. GEORGE W. GIRVIN, RALPH J. SCHLOSSER, GILBERT G. EADE, and K. ALVIN MERENDINO. *Surgery*, 1957, 42: 710.

THE PRESENT STUDY concerns the fate of teflon as an arterial prosthesis in growing animals. The authors utilized a tightly woven catheter of teflon fabric with a thread count of 76 by 65, a thickness of 0.0091 inches, and a porosity of 1.86 cubic feet of air per minute. A second fabric had a thread count of 142 by 44, a thickness of 0.00167 inches, and a porosity of 1.86 cubic feet of air per minute. The fabric was sterilized by autoclaving for 20 minutes after preliminary scrubbing to remove additives.

Nine pigs weighing between 15 and 18 kg. were used and through a left fifth intercostal thoracotomy the descending aorta was mobilized. So-called compilation teflon grafts were inserted using a temporary, intraluminal, lucite shunt for the distal anastomosis and two-thirds of the proximal anastomosis. The shunt was removed and the proximal anastomosis completed. Compilation grafts were created by suturing a strip of the excised aortic segment into the teflon graft in such fashion that it composed one-third of the circumference of the graft with the fabric comprising the additional two-thirds. These grafts thus were made of teflon tube from which a narrow strip of fabric had been excised along the long axis. Into this defect was sutured a strip of excised aorta. This type of graft, it was thought, would allow for growth of the graft as the animal grew and thus prevent postoperative relative stenosis of the graft with growth of the animal. Endothelialization of the fabric occurred from the ends of the host vessel and also from the longitudinal autograft as well. The autograft strip grew well. Initially it comprised an average of 34 per cent of the circumference but approximately 61 per cent of the graft circumference when the animal was

sacrificed some months later. While average growth of the adjacent host vessel was about 60 per cent, the transplanted strip grew an average of 16 per cent in length and an average of 213 per cent in width. This longitudinal growth created some minor bowing of the graft with the fabric on the concave side but no serious deformity ensued. One fatal thrombosis occurred. Two other animals died before maturity. The longest period that a graft was observed in this series was 293 days, but there are presently grafts up to 12 centimeters long serving satisfactorily in dogs 24 months after implantation. The first replacement in a human being has been implanted over 15 months without complication. The authors conclude that teflon fiber is a chemically inert nonpermeable material and as a low porosity taffeta weave serves as a highly satisfactory aortic prosthesis.

—*Allan D. Callow, M.D.*

Recurrent Idiopathic Polyphlebitis (Polyphlebitis idiopathica recurrens). G. Riva and Ch. Meuli. *Schweiz. med. Wschr.* 1957, 87: 635.

The case report presented concerns a white male patient, who was first seen by the authors when he was 43 years old. At the age of 12 years the patient had had thrombophlebitis of the right femoral area. For a period of 6 years he had had recurrent episodes of thrombophlebitis involving 20 to 30 centimeters of long venous segments. The recurrent episodes were not prevented by the injection of superficial veins with thrombosing solutions. When the patient was 18, the Trendelenberg procedure was performed on the right lower extremity, but this did not prevent centripetal propagation of the disease. The latter was manifested by abdominal pain and a nephrotic syndrome, a sequel of involvement of the renal vein. A recurrent episode of thrombophlebitis of the right lower extremity was noted 3 years later. At the age of 22, the patient was involved in an automobile accident and pulmonary embolism with infarction and associated peripheral phlebitis was noted. In the years before this patient came under the authors' observation he had suffered more than 30 individual episodes of thrombophlebitis of different veins of the whole body from the neck down.

During the last episode in which the patient was hospitalized, the physical examination revealed the arterial system to be within normal limits. The areas of acute phlebitis presented tender and firm stringy formations. The areas of both ankles were scarred and hyperpigmented. Detailed studies as to blood coagulation were performed. The only abnormal finding was a decreased fibrinogen level of 1.97 per cent (normal 4 to 6 per cent). Paper electrophoretic studies of serum proteins revealed a globulinemia with increase of alpha and beta globulins on one examination and an increase of gamma globulins on another.

Widespread involvement of the superficial veins and deep thrombophlebitis are of rare occurrence. The fact that veins in various sites were involved and the association with abnormal protein changes and increased sedimentation rate suggests to the authors that inflammation is the underlying factor. The clinical character, in part of the course of the disease, was one of recurrence with periods of months to years of no disease; and a course of recurrence of a migratory character, of venous involvement in continuo or of recurrence with only short asymptomatic periods.

Though unquestionably incapacitating, the relatively benign course of the disease is characteristic. The authors make a point of differentiating this condition from the so-called thrombophlebitis migrans associated with or preceding Buerger's disease.

The authors reviewed the literature on the subject of idiopathic thrombophlebitis. They mention in particular the analysis of case histories from the Mayo Clinic by Ackerman and Estes. In 88 cases 33 per cent had only one episode of thrombophlebitis and 67 per cent had the recurrent course. From the review of the literature the authors conclude that 8 per cent of all thrombophlebitides can be classified as idiopathic. In 3 to 4 per cent of such cases the clinical course is much like that of a thrombophlebitis with known underlying causative pathologic processes. Only 4 to 5 per cent of the thrombophlebitides show no underlying pathologic condition and no recurrent episodes.

The authors mention some characteristics discovered by Barker. In 88 per cent of 40 patients with recurrent idiopathic thrombophlebitis, males were affected and short segments of small or medium sized veins were involved. In 16 patients the disease lasted one year; in 9 more than 5 years. The interval between the individual episodes was several days to one month in one-half of the patients; the other half showed recurrences in 6 weeks to 4 years. Only 1 of the 40 patients died; the cause of death was mesenteric thrombosis with melena. Pulmonary embolism occurred in 30 per cent of the patients. Idiopathic recurrent thrombophlebitis is not a "new" disease as the articles of Jadioux (1845), Fremy (1864), and Paget (1866) indicate. —*Karel B. Absolon, M.D.*

Postphlebitic Syndrome. Geza de Takats. *J. Am. M. Ass.*, 1957, 164: 1861.

The postphlebitic syndrome is caused by thrombosis of the deep veins of the lower extremities or pelvic veins. Although deep venous thromboses in most cases start in the foot or the calf, they are seldom seen at this stage. In many cases deep venous thrombosis follows childbirth, injury, operation, or prolonged immobilization, but often there is no antecedent history. Early recognition of deep venous thrombosis and intensive treatment with heparin, elevation, diuretics, elastic bandages, and early ambulation are stressed as measures for the prevention of the postphlebitic syndrome.

Recanalization following deep venous thrombosis is invariably associated with destruction of valves so that there is a postural regurgitation. The flow of blood through the incompetent communicating veins is reversed, especially during coughing, straining, or sneezing. The unfortunate sequelae which follow in progression are edema, pigmentation, varicosities, pain, stasis dermatitis, induration, and ulceration.

Edema is controlled by postural drainage, elastic bandages or stockings, restriction of liquid and salt intake, and the use of diuretics in selected cases. All superficial varicosities should be stripped and excised, with special attention to incompetent perforators. For the stasis dermatitis wet dressings of aluminium subacetate alternating with vioform ointment

have been useful, as have steroid ointments. Although the author suggests small doses of x-ray and the use of a glycerin-gelatin cast for marked induration of the lower extremities, he states that ultimately excision of the induration is best. Ulcers are best treated by wide excisions and grafting. Experience has shown that most grafts will hold up under severe strains for periods of 15 to 20 years. However, patients with large skin grafts should not be without elastic support during the day, and in some instances should be advised to change their occupations. A small number of popliteal vein ligations were done, but recently all deep vein ligations for postthrombotic sequelae have been abandoned. Sympathectomy has been done only when the extremity is cold and clammy or when there is excessive hyperhidrosis. —*George R. Holswade, M.D.*

The Use of Powdered Gelatin Foam in the Treatment of Vascular Ulcers. SAMUEL FELDMAN, MURRAY M. MAHL, and JOSEPH GOODGOLD. *Angiology*, 1957, 8: 345.

A CLINICAL STUDY is presented in which a total of 248 ulcers of the upper and lower extremities were treated in a uniform manner with the employment of a sterile, absorbable, gelatin foam sponge. There were 186 venous ulcers of the varicose or postphlebitic type. The remaining 62 were arterial ulcers, the majority of which were secondary to arteriosclerosis with or without associated diabetes.

The ulcers were first thoroughly cleansed and the necrotic tissue was debrided. The base and the edges of the ulcer were scarified to induce active capillary bleeding, and sterile, absorbable, powdered gelatin foam was then firmly packed into the ulcer and a dry dressing applied. The ulcer was inspected at 5 to 7 day intervals, with repetition of the above process when necessary. When cellulitis complicated the ulcers, antibiotics were given, usually by mouth. When advisable, such additional therapy as postphlebitic care, general foot hygiene, circulatory exercises, vasodilators, sympatholytic drugs, paravertebral or local nerve blocks were used.

One hundred and ninety seven of the 248 ulcers had been previously treated by other methods with poor results. With the present regime, 162 were healed, 49 were improved, and 37 were unimproved. The results were considerably better with the venous ulcers as compared with the arterial ulcers.

The authors believe that the powdered gelatin foam promotes faster healing by stimulating the formation of granulation tissue and epithelization, and by acting as a scaffold for granulation tissue and epithelium. The patients were able to be ambulatory, and often were able to continue with their regular occupations. No allergic reactions were noted. Treatment was painless after the first 24 hours, and the pain during this initial period was usually controlled by simple analgesics. —*E. Thomas Boles, Jr., M.D.*

Gangrene of the Extremities of Venous Origin (Les gangrènes des membres d'origine veineuse). P. WERTHEIMER, J. FAVRE-GILLY, J. DESCOTES, and CL. GABRIELLE. *Sem. hôp. Paris, Ann. Chir.*, 1957, 11: 649.

THE EXISTENCE of gangrene of purely venous origin has been definitely established by angiography. The condition is rare. In contrast to an intact arterial system, studies showed the venous system to be extensively thrombosed with complete obliteration of the return circulation. Angiography proved the anatomical integrity of the venous system and refuted the frequently invoked hypothesis of arterial spasm.

Analysis of the published data did not point out any particuliar set of etiologic agents. Postoperative, posttraumatic, postpuerperal, or even spontaneous phlebitides, or advanced cachexia preceded this condition. Its recurrent character was significant. Also, it affected an already edematous extremity, which differentiated it from ischemia due to various other types of phlebitis. Pain and cyanosis were usual.

Differential diagnosis must be made from hemorrhages accidentally produced by the anticoagulants. The pseudoembolic forms of thrombophlebitis could be excluded because the pain affected a nonedematous extremity. Gregoire's phlegmacia cerulea dolens could be excluded only by arteriography.

During the stage of cyanosis without gangrene, spasmolytic agents, vasodilators, and infiltration of the lumbar sympathetic ganglia were employed. Their uniform failure suggested the diagnosis of gangrene on the basis of venous obstruction. At this stage refrigeration was not recommended and the efficiency of the anticoagulants was doubtful. Attempts should be made to bring about decongestion of the limb by elevation and active and passive mobilization.

Periarterial and perivenous sympathectomy are of questionable value. Exploratory procedures to determine the vascular state are dangerous if iliac or caval veins are involved. Although relief of obstruction is the most rational procedure, the best surgeons have not been able to surmount the practical difficulties involved. With gangrene definitely established, surgery can only offer amputation.

—*Sidney Smedresman, M.D.*

BLOOD; TRANSFUSION

Deficient Thromboplastin Formation in Man. MARC VERSTRAETE and J. VANDENBROUCKE. *Am. J. Med.*, 1957, 22: 624.

THIS ARTICLE concerns hemorrhagic diatheses caused by a disturbance in thromboplastin formation. If the problem is delimited to a deficiency of antihemophilic globulin, plasma thromboplastin component, plasma thromboplastin antecedent, and a first phase anticoagulant, all of these patients have some clinical features in common. The bleeding is chiefly located in the deep tissues and joints and occurs either spontaneously or following minor trauma. Petechiae, purpuric manifestations, and bleeding or oozing from the skin or subcutaneous tissues are rare and not at all typical. As the characteristics of this group seem so striking, the generic name "hemophilia syndrome" has been proposed for this particular bleeding tendency.

This report is based on an extensive study of 46 patients whose hemorrhagic diathesis fits this description of "hemophilic syndrome." The relative occurrence, characteristics, and the diagnostic tests which differentiate these conditions are described. The varied causes of the diatheses are summarized: (1) antihemophilic globulin deficiency in classic hemophilia (hemo-

philia type A) in men or homozygote women (daughters of a hemophiliac type A and carrier of the antihemophilic gene type A); (2) plasma thromboplastin component (P.T.C.) deficiency (Christmas disease or hemophilia type B); (3) plasma thromboplastin antecedent (P.T.A.) deficiency (hemophilia type C); (4) combined antihemophilic globulin and plasma thromboplastin component deficiency; (5) a circulating anticoagulant may complicate the antihemophilic globulin or plasma thromboplastin component deficiency and aggravate these conditions; (6) presence of a circulating anticoagulant in nonhemophilic men; (7) in women, the presence of a circulating anticoagulant which may or may not be related to a recent pregnancy; and (8) antihemophilic globulin deficiency in women not belonging to a hemophiliac family. This condition is usually associated with a vascular defect.

LYMPH GLANDS AND LYMPHATIC VESSELS

Primary Lymphedema; Clinical and Lymphangiographic Studies of a Series of 107 Patients in Which the Lower Limbs Were Affected. J. B. KINMONTH, G. W. TAYLOR, G. D. TRACEY, and J. D. MARSH. *Brit. J. Surg.*, 1957, 45: 1.

THE AUTHORS describe the clinical findings, the findings at lymphangiography, and the treatment of 107 cases of primary lymphedema. The cases in the series are those known variously as idiopathic lymphedema, lymphedema of unknown origin, and spontaneous lymphedema. Ninety-five of them were classified as lymphedema praecox and 12 as congenital lymphedema. Over 70 per cent of the patients were female and all of the patients of the series had involvement of the lower limbs only. Eighteen patients (17 per cent) gave a history of permanent edema in other members of the family. An hereditary familial tendency fits in with the concept that the disease is due to an inborn error in the development of the lymphatics, and this is suggested by lymphangiography. Two of 18 patients with a family history of the disease were born with edema present and were, therefore, considered victims of Milroy's disease. The authors believe that it is doubtful whether this so-called disease differs other than in degree from other familial cases. The suggestion is made that these may be tabulated as cases of lymphedema congenita, lymphedema praecox (before 35) and lymphedema tarda (after 35). Eleven patients had associated congenital anomalies but except for blood vascular anomalies in 7 the others had no obvious relationship in their anomalies to the lymphedema. Most of the patients were studied by injection of the diffusable dye, patent blue violet, into the subcutaneous tissue between the toes. After massage of these areas the dye was taken out by the subcutaneous lymph trunks. Some of the dye-filled vessels may be seen in the dorsum of the foot in a normal subject with thin skin. This method is referred to as visible lymphangiography. Suitable levels for inspection of the lymphatic trunks are across the middle of the dorsum of the foot where four trunks can usually be seen, anterior to the ankle joint where two slightly larger trunks are found, in the groin near the inguinal nodes, or in the popliteal fossa. The second method is that of lymphangiography in which diodone is injected directly through a fine needle into a lymph trunk previously visualized with patent blue. Roentgenograms are subsequently taken to show the course of the diodone. This method is not applicable if the trunks are absent or of a diameter much below normal. Full data available for analysis was at hand for 87 of the 107 patients. The lymphangiograms revealed the following:

Hypoplasia	49 (55 per cent)
Dilatation (varicose)	21 (24 per cent)
Aplasia	12 (14 per cent)
Dermal backflow alone	5 (6 per cent)

Utilizing a variant of the operation of Charles described in 1912, the skin was cut as almost a full-thickness graft with an electric dermatone. The strips obtained were sewn side to side by a second surgeon while the first continued to excise tissue and prepare the limb for application of the graft.

In 12 patients no lymph trunks could be found in the areas explored. It was not uncommon in these patients to see the dye spread in the dermal plexus of the dorsum of the foot, sometimes extending to the ankle or beyond. Exploration of the full width of the dorsum of the foot in front of the ankle revealed an entire absence of subcutaneous lymph trunks. Microscopic sections of excised tissue showed small subcutaneous lymph spaces unconnected with each other, in the manner of diminutive isolated cysts. There were 49 patients in whom the lymph trunks were found to be deficient in size or number or both. Roentgenograms, taken after injection of a trunk with diodone, showed small, or few, trunks extending upward. Twenty-one patients showed varicose, dilated lymph trunks in which the lymphatics were broader than normal and more tortuous. Incompetence was shown by retrograde injection or lateral or backward flow of the dye into other numerous trunks. Abnormal filling of the dermal plexus leading to dermal backflow was seen in 19 patients with lymphedema. Here the lymph in the dermis runs in a fine network of valveless capillaries and is led from it to the deeper trunks beneath the skin by collecting trunks which have valves. In patients with an acquired localized lymphatic block which was known to exist and which had been produced by such things as malignant disease, irradiation, or trauma, similar findings with backflow were noted. There were 6 such cases of what might be classed as descending edema and in 5 of them dermal backflow was shown by lymphangiography. The authors have noticed that secondary lymphedema develops in the same way, following, for example, a block dissection of groin and pelvis. They have seen the lymphedema start near the block dissection and extend distally along the limb and believe, therefore, that it would seem correct to interpret the findings as primary lymphedema, with dermal backflow due to lymphatic incompetence, with edema developing in normal tissues distal to an area of lymphatic stagnation or obstruction. Patients with aplasia or varicosity of the lymphatics tend to have edema from birth or from an earlier age than those with hypoplasia.

The drainage of fluid from tissue by the lymphatics and the role of this in the formation of edema may be an oversimplification for the authors believe that the chief role of the lymphatics in regard to the drainage

is to carry off from the tissue space substances of large molecular size. The part played by the water content is secondary to this. The result of lymphatic dysfunction is an accumulation in the tissue spaces of substances of a molecular size large enough to make the return to the blood stream through the capillary walls difficult. Accumulation of protein occurs in the tissue spaces if lymphatic drainage is inefficient with consequent retention of water and edema.

—*Allan D. Callow, M.D.*

MISCELLANEOUS

Use of Different Tissue Thromboplastins in the Control of Anticoagulant Therapy. MARC VERSTRAETE, PATRICIA A. CLARK, and IRVING S. WRIGHT. *Circulation*, 1957, 16: 213.

THIS STUDY is an evaluation of the dependability and significance of different types of tissue thromboplastins in the determination of the effects of coumarin derivatives.

Eight different thromboplastin extracts, commercialized in the United States, were selected for this study. They were prepared in accordance with the methods described by the manufacturers. The main difference between thromboplastin extracts seems to be the fact that those prepared from the brains of animals have a factor VII-like activity. As the exact evaluation of the factor VII activity seems to be of primary importance in patients treated with coumarin derivatives, the use of a thromboplastin preparation devoid of factor VII activity is recommended.

Acute Thrombocytopenic Purpura as a Postoperative Complication. C. MARKS. *Centr. African J. M.*, 1957, 3: 262.

THROMBOCYTOPENIC PURPURA is a symptom complex which is associated with prolonged bleeding time, normal coagulation and prothrombin times, increased capillary permeability, diminution of circulatory platelets, and poor clot retraction. It may be caused by infection, idiosyncrasy to a drug or other toxic agents, or it may be idiopathic (Werlhof's purpura).

A case of thrombocytopenic purpura is reported in a 32 year old woman who had a segmental resection for a tuberculous cavity in the left upper lobe. She had received para-aminosalicylic acid and streptomycin for 3 months prior to operation and penicillin and streptomycin were given during the postoperative period. Ten days after the operation she developed hemorrhagic blisters in the mouth, gross bleeding from the urinary and intestinal tracts, and a diffuse purpuric eruption on the abdominal wall. The platelet count was 2,000 per c.c. The clotting time was 8 minutes with poor clot retraction. Bleeding time was 28 minutes. The capillary resistance test was positive. There was no eosinophilia. Sternal marrow studies indicated a maturation arrest of the platelet series. Treatment consisting of repeated transfusions, vitamin C, rutin, cortisone, and ACTH failed to change the clinical course. Since there had been no significant rise in the platelet count following transfusions, the author reasoned that active platelet destruction was occurring. Accordingly, 10 days after the onset of the bleeding a splenectomy was performed. Almost immediately the bleeding stopped and the results of blood studies returned rapidly to normal.

Attention is called to a condition called onyalai which is frequently seen in the Central African Bantu, but not encountered in other parts of the world. Onyalai is characterized by the formation of large hemorrhagic bullae in the mouth, nose, and tongue. It apparently is an acute form of thrombocytopenia. The author believes that this was a case of acute thrombocytopenia purpura with onyalai, and that the streptomycin had acted as a "trigger" mechanism in precipitating the acute attack.

—*George R. Holswade, M.D.*

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Studies on Timing of Tissue Transfer in Reconstructive Surgery; Effect of Delay on Circulation in Flaps. F. S. HOFFMEISTER. *Plastic & Reconstr. Surg.*, 1957, 19: 283.

THE CIRCULATORY improvement which follows delay in tissue transfer in reconstructive surgery indicates that the basic premise of the delaying procedure is correct.

To transfer a flap with a delay of 1 week represents a hazard to the flap even when 2 or 3 incisions are used.

The anatomical design of the flaps has a significant effect on the resulting circulatory improvement. The use of two parallel incisions does not produce any significant circulatory improvement. On the other hand, the use of three incisions does produce a significant circulatory improvement. In order to derive maximum benefit however, the transfer would have to be synchronized with the circulatory peak, which is clinically impracticable. However, significant circulatory improvement resulted even if the delay interval was standardized at 3 weeks.

—*John J. Maloney, M.D.*

Prophylaxis and Therapy of Postoperative Thromboembolism (Prophylaxe und Therapie der postoperativen Thromboembolie). H. WIMHÖFER. *Medizinische*, 1957, 15: 900.

MANY PROCEDURES have been instituted for reduction of postoperative mortality, including transfusions, chemotherapy, antibiotics, and selective methods of anesthesia. Less has been accomplished in the prevention and treatment of postoperative thromboembolism. Recent statistics from German and Scandinavian clinics are cited, showing that in obstetric cases the incidence of thromboembolism ranged from 0.62 to 2.15 per cent with embolism developing in 10 to 35 per cent and fatal embolism in 2.3 to 4.9 per cent, or considered in relation to the total birth rate, a loss of 0.022 to 0.074 per cent. In gynecologic operations, the incidence of thromboembolism was 0.66 to 3.5 per cent, embolism developed in 25 to 66 per cent of the patients and a fatal outcome in 10 to 25 per cent of all the cases of thromboembolism. The incidence of fatal embolism in relation to the total number of cases operated upon ranged from 0.1 to 0.65 per cent. The figures from various surgical clinics agree. The general constitutional peculiarities associated with a tendency to thromboembolism are well known, but will not suffice for prophylactic purposes. With regard to the usual prodromal symptoms, spontaneous or induced pain in the calves, pain on dorsal flexion of the foot, the so-called Homan's sign, as well as pain on pressure in the sole of the foot, Payr's symptom, and unexplained changes in pulse and temperature, all must be taken into consideration. Edema, cyanosis, formation of a collateral venous circulation, and cording of the veins indicate thrombotic obstruction and present imminent danger of infarction.

In a previous review of 1,506 laparotomies at the Heidelberg Gynecologic Clinic, 225 cases were considered susceptible to thromboembolism and of these, thromboembolism developed in 7.1 per cent and embolism in 4.9 per cent. Of 1,281 cases which were considered nonsusceptible, thromboembolism developed in 1.5 per cent and embolism in 0.6 per cent.

The physiologic and pathologic studies of coagulation have contributed little toward the early diagnosis of thromboembolism. One of the most sensitive tests for the recognition of a tendency toward pathologic coagulation is Hartert's recalcification method using the thromboelastograph. The determination of the thromboplastin time alone, as in the Quick test, will not suffice. Of 2,176 cases controlled with the thromboelastograph 1,048 showed no signs of disturbance in coagulation. Among these there occurred 1 manifest thrombosis, 2 mild pulmonary infarcts, and 1 fatal embolism.

In 768 the coagulation time was shortened and the patients were accordingly given prophylactic treatment. There developed 2 mild manifest thromboses, 19 infarcts, but no fatal embolism. The early recognition and consequent possible early treatment may prevent manifestation of thrombosis and the development of large fatal emboli. The over-all result was satisfactory, considering that in a series of 2,176 patients only 3 manifest thromboses and 1 fatal embolism developed. All of the 21 infarcts subsided shortly, leaving no clinical residual symptoms.

In a series of 32 thromboembolisms, 23 could be foretold by a preceding shortening of the reaction time in the thromboelastograph. In only 10 of 30 cases did the Quick test show abnormal findings. This would seem to indicate that analysis of coagulation of the blood in thromboelastograms constitutes a decided step in advance in the early diagnosis of the tendency toward thromboembolism.

In considering the general and specific measures for prophylaxis of thromboembolism, the author mentions in addition to the usual measures, daily massage and immediate ambulation, that is, the patient is allowed up on the day of the operation. Besides the usual circulatory agents, a tonic for the veins is recommended, namely venostasin, an extract of horse chestnuts containing vitamin B_1. Treatment for anemia and infection is, of course, imperative. Prophylactic transfusion and administration of anticoagulants are also recommended.

Preventive therapy is administered: (1) to patients with premonitory symptoms, and in doubtful cases in which the thromboelastographic reaction time may be the determining factor; (2) to patients exhibiting a demonstrable shortening of the thromboelastographic reaction time, even in the absence of prodromal symptoms, and (3) to patients subjected to the operations which are most likely to be complicated by thromboembolism, and particularly to those undergoing plas-

tic operations. Marcumar was selected for prophylactic treatment because of its higher efficacy in small doses and prolonged uniform effect. A cumulative effect must be avoided. Neither the Quick test nor the thromboelastograph alone suffices for determination of the proper dosage. The prothrombin index must be reduced close to the limit of a hemorrhagic diathesis. It has been shown that within normal therapeutic limits, the Quick test largely coincides with the thromboelastograph, but in severe cases in which there is threatening hemorrhage the thromboelastograph will show greater sensitivity. Severe hemorrhage did not develop in instances in which the thromboelastographic reaction time was prolonged less than 2 to 2.5 times. A safe gauge for individual dosage is therefore possible only with the use of both the Quick test and the thromboelastograph. Even under optimal conditions, cumarin has only a limited prophylactic value, although no fatal embolism or really severe thrombosis was encountered during its use. Cumarin acts by inhibiting the formation of prothrombin in the liver, so that its therapeutic effect does not assert itself until 48 hours have elapsed. In cases with severe prodromal symptoms one has, therefore, frequently to resort to the more promptly acting intravenous heparin or heparinoids which will insure immediate incoagulability of the blood for 4 to 8 hours. High cost and the necessity of intravenous administration render prolonged use inconvenient. For this reason, after the acute phase has subsided, and following a few days of rest in bed, treatment is best continued with oral administration of cumarin with a careful Quick test and a control examination with the thromboelastograph. With this treatment the author experienced no recurrence of infarcts and no progression of any thrombotic process. Should transfusion be indicated, 5,000 units of liquaemin are injected with every 11 c.c. of banked blood. The use of thrombocid was discontinued owing to several hypersensitivity reactions and 1 severe pulmonary infarct. The optimal effect of the treatment described was demonstrated by an increase in the Quick test from 15 to 20 per cent and in the thromboelastograph from 150 to 250 per cent. Charts showing the effects of anticoagulants and prophylaxis are included.

During the more recent period of planned prophylaxis, the incidence of thromboembolism at the Gynecologic Clinic fell from 1.21 per cent to 0.32 per cent and the incidence of fatal embolism from 0.17 per cent to 0. —*Edith Schanche Moore.*

Prophylactic Measures in Thromboembolism with Special Emphasis on the Use of Butazolidin (Erfahrungen in der Thromboembolieprophylaxe mit besonderer Beruecksichtigung von Butazolidin). P. Schmidlin, O. Kym, H. Stamm, and Others. *Schweiz. med. Wschr.*, 1957, 87: Supp. 24.

This study is a collaborative effort of several Swiss clinics to establish the usefulness of butazolidin in the prophylaxis and treatment of thrombosis and embolism in addition to the methods already in use. Schmidlin and Kym review the background of butazolidin. In past investigations the antiphlogistic effect was established and this proved to be even more potent than its analgesic and antipyretic effect. Experimentally the early stages of inflammation were modified most intensively. Clinically, a beneficial effect was observed on superficial and deep thrombophlebitis.

Stamm reviews the diagnosis of thromboembolic disease and its prophylaxis. Symptoms appear early only in cases of thrombophlebitis with primary inflammation of the venous wall; the author believes that the main causative factors are hemodynamic changes, such as those which occur after surgical procedures. Bacterial endophlebitis with redness along the vessel, pain, and heat is typical. Phlebothrombosis, on the other hand, is not associated with local symptoms in the early stages. Pulmonary embolism may be the first sign in such situations.

The use of anticoagulants is of limited prophylactic value early after surgical operations because of the possibility of initiating hemorrhage. Fibrinolysis therapy, which was developed by Meneghini, employing hyperpyretic agents, is similarly of limited value. Early ambulation and the use of physical medicine plus dietetic prophylaxis (low salt vegetarian diet), introduced by Koller, are highly effective. The aforementioned methods resulted in a decrease in the mortality caused by pulmonary emboli to 20 per cent of the initial rate.

Willenegger *et al.* discuss measures which prevent thromboembolism without the use of anticoagulants such as early ambulation and compression bandages for the lower extremities. Venostasis in the pelvic and leg veins is emphasized as a basic causative factor. Out of 3,067 patients who were operated upon by the authors, 85.5 per cent were walking within 4 hours postoperatively; 14.5 per cent (445 patients) could not be mobilized until later. In the first group only one death was caused by pulmonary emboli; in the second group 5 fatal pulmonary emboli occurred.

Butazolidin was tried in addition to the above measures. Six to 10 injections of 600 to 1000 mgm. each were administered every second day beginning on the day of operation to 53.6 per cent of 1,816 patients. The authors' interpretation of the results emphasizes the analgesic effect which makes mobilization easier; superficial thrombophlebitis was decreased. The latter is perhaps the main specific effect of butazolidin and this finding is in agreement with all the analyses which follow.

Block and Lemay used a therapeutic schedule of injections of 600 mgm. on the first, second, fourth, sixth, and in some cases the eighth, postoperative day in 334 patients together with the routine prophylaxis of early mobilization, compression bandages, elevation of the foot of the bed, and respiratory gymnastics. Though the total incidence of thromboembolism was 3.8 per cent in the butazolidin series no case of superficial thrombophlebitis was observed; there were thromboembolic complications in 2.63 per cent of the control series and superficial thrombophlebitis was found in 1.3 per cent.

In 41 patients treated with butazolidin combined with the anticoagulant phenoprocoumarol, a thrombotic complication rate of only 2.1 per cent was noted. The authors believe that although a definite prophylactic value was established in preventing superficial thrombophlebitis, deep thrombophle-

TABLE I.—BUTAZOLIDIN IN PROPHYLAXIS OF THROMBOEMBOLIC DISEASE

	No. of cases		*Superficial v. thrombosis*		*Abortive deep v. thrombosis*		*Typical deep v. thrombosis*		*Questionable emboli*		*Emboli*		*Fatal emboli*		*Total thrombo-embolic complications*	
	C	*B*	*C*	*B*	*C*	*B*	*C*	*B*	*C*	*B*	*C*	*B*	*C*	*B*	*C*	*B*
H. Willenegger...	841	975	16	7	3	5	8	5	15	11	13	13	3	3	58	44
			1.9%	0.7%	0.4%	0.5%	1.0%	0.5%	1.8%	1.1%	1.5%	1.3%	0.4%	0.3%	6.9%	4.5%
H. Bloch.....	2420	334	31	0	—	—	24	6	—	—	5	2	4	5	64	13
			1.3%	0%			1.0%	1.8%			0.2%	0.6%	0.2%	1.5%	2.6%	3.8%
H. Heusser.....	3251	1026	—	—	—	—	?	1	—	—	—	—	24	7	24	8
								0.1%					0.5%	0.7%	0.7%	0.8%
H. Aeppli.....	603	703	—	—	—	—	2	0	2	1	13	0	0	0	17	1
							0.3%	0%	0.3%	0.14%	2.2%	0%	0%	0%	2.8%	0.14%
O. Kaeser.....	411	527	—*	—	—*	—	1*	5	—*	—	2*	6	1*	1	4*	12
							0.2%	0.9%			0.5%	1.1%	0.2%	0.2%	1.0%	2.3%
Th. Koller.....	2688	1482	107	11	85	13	105	38			74	29	5	0	376	91
			3.98%	0.74%	3.16%	0.88%	3.90%	2.56%	—	—	2.75%	1.95%	0.19%	0%	13.98%	6.14%
Total.....	10214	5047	154	18	88	18	140	55	17	12	107	50	29	15	535	168

	Superficial v. thrombosis		*Deep v. thrombosis*		*Emboli*		*Fatal emboli*	
	C	*B*	*C*	*B*	*C*	*B*	*C*	*B*
C—Control	154	18	228	73	124	62	29	15
B—Butozolidin Treated	1.6%	0.4%	2.3%	1.4%	1.3%	1.2%	0.3%	0.3%
*=Series with phenprocoumarol	Thrombophlebitides and thromboses				Nonfatal and fatal emboli			

C=382 (3.9%) B=91 (1.8%) C=153 (1.6%) B=87 (1.7%)

C=535 (5.5%) Total thromboembolic complications B=168 (3.3%)

bitides were only masked. A recommendation to investigate the combined use of butazolidin with anticoagulants is made. Boerlocher believes that the use of butazolidin decreased the incidence of fatal pulmonary emboli in his patients.

Aeppli and Rageth were able to decrease the incidence of thromboembolism from 2.82 per cent to 0.14 per cent in patients treated with butazolidin. In major surgical procedures an even greater decrease from 3.78 per cent to 0.36 per cent was noted. Kaufmann discusses his experience with butazolidin at the St. Gallen Hospital. As phenoprocoumarol had previously been used routinely in major gynecological cases, starting on the third postoperative day, a fair comparison could be made. With butazolidin, thromboembolic complications increased from 0.96 per cent to 2.26 per cent. He concludes that butazolidin is not a thromboembolic prophylactic agent and that this drug is not a replacement for anticoagulants in all cases. Butazolidin makes ambulation of the patient easier and in his hands replaces anticoagulants in patients with bleeding tendency.

Perhaps the most important aspect of these authors' study is the beneficial influence of butazolidin on the general postoperative and postpartum condition of the patient, which makes ambulation an easier task. The value of butazolidin in the prevention of deep thrombosis and embolism was not established although superficial thrombophlebitis was effectively prevented. How well butazolidin, which is an established anti-inflammatory agent, can prevent deep thrombophlebitis could not be determined with certainty. Its anti-inflammatory, analgesic, and antipyretic properties are valuable and its use may be found, therefore, as a complement to the usual measures against thromboembolic disorders. The definite indications for butazolidin and the most suitable combination of prophylactic measures remains to be established.

In experimental studies by Stamm and Triebold as to the effect of butazolidin in the stress syndrome, the blood cellular factors usually found as a response to stress remained unaltered. The mechanism of action of butazolidin was thought to be on the vegetative centers. In rats no influence on the course of pregnancy and specifically no estrogenic effect was found. Histologically examined tissues, including the pituitary, the adrenal glands, the uterus, ovaries, liver, and the kidneys, showed no pathological changes.

The fact that butazolidin did not produce any side effects in the clinical cases or in experimental animals deserves emphasis. —*Karel B. Absolon, M.D.*

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Twenty-four Cases of Frostbite (Sur vingt-quatre cas de gelures). ANDRÉ LAPRAS. *Sem. Hôp. Paris, Ann. chir.*, 1957, 11: 661.

THE 24 PATIENTS in this group were of a low social level and had been exposed to an unusually severe winter. There were 5 deaths. Extensive studies were carried out under hospital conditions and it was found that sympathetic nerve block was effective only in the early stages. Actually it was a form of internal application of heat. To be effective the ensuing vasodilatation should be accomplished during a vasoconstrictive phase. Later on it only supplements the spontaneously occurring vasodilatation.

Anticoagulant therapy did not give any valuable results. When used in the first stages of freezing it was followed by complete cures. However, at that stage there were no thrombi that appeared to indicate its use. Concomitant immobilization and warmth might have accounted for the accompanying cures. It appears that in the early stages controlled heat may of itself give good results. Palliative methods, by suppressing complications, may accelerate healing.

Frostbite is a serious illness. In the majority of cases it is seen in an advanced stage where its therapy is that of gangrene. —*Sidney Smedresman, M.D.*

Experimental Enzymatic Dissolution of Soft Tissue Hematomas; Streptokinase-Streptodornase and Hyaluronidase. C. ALLEN WALL and C. ROLLINS HANLON. *Surgery*, 1957, 42: 536.

THE AUTHORS have studied the enzymatic dissolution of soft tissue hematomas by the use of streptokinase-streptodornase combined with hyaluronidase. This work was carried out at the Walter Reed Army Medical Center. The principle behind the study was that the dissolution of soft tissue hematomas might best be facilitated by combining the fibrinolytic property of SK-SD to promote liquefaction of the blood clot and the spreading factor of hyaluronidase to aid in dispersion of the liquefied blood.

The study was carried out in 21 adult mongrel dogs. The dogs were anesthesized and two rubber-shod intestinal clamps were placed in each groin thus isolating the subcutaneous area. One hundred c.c. of blood were withdrawn from the heart and 50 c.c. were placed in each groin area. One area was to serve as a control for the other. In untreated hematomas it took from 9 to 15 days for the hematoma to be completely resorbed. The animals were divided into four groups. In the first group SK-SD was compared with saline control, in the second hyaluronidase was compared with saline control, in the third SK-SD and hyaluronidase were compared with saline control, and in the fourth SK-SD and hyaluronidase were compared with SK-SD alone. The dosage used was 25,000 units of streptokinase and 6,250 units of streptodornase diluted in 5 c.c. of saline solution and 400 viscosity units of hyaluronidase diluted in 12 c.c. of saline solution were used. The SK-SD alone produced a softer and smaller hematoma in 24 hours. Hyaluronidase alone was without effect. SK-SD and hyaluronidase produced a small softer hematoma in 24 hours and also complete resorption required less time in all dogs. SK-SD and hyaluronidase compared with SK-SD alone produced smaller and softer hematomas in both of the groups within 24 hours with the rate of absorption being greater in 5 of the 6 dogs with instillation of both enzymes. The authors conclude from their study that hyaluronidase with SK-SD significantly accelerates hematoma resorption in dogs under the experimental conditions. —*Peter Dineen, M.D.*

Modern Therapy of Tetanus (Zur neuzeitlichen Therapie des Tetanus). K. DEVENS and P. SCHOSTOK. *Chirurg*, 1957, 28: 253.

ACCORDING to the war statistics, the occurrence of tetanus after injuries was considerably lower in the American army, who were actively immunized, as compared with the German forces who were not immunized. A large scale immunization of the population is greatly desired but has not yet been carried out; 200 to 300 cases of tetanus are still registered yearly.

At the surgical clinic in Giessen, 72 patients with tetanus were treated in the period from 1930 to 1955. The mortality was 49 per cent in the years 1930 to 1950; it fell to 36 per cent in the years 1951 to 1955, when newer methods of treatment such as curare preparations, phenothiazines, and modern means of artificial respiration were employed. The fall in mortality, however, was only noticeable in the less severe cases of tetanus (grades I and II). Altogether three grades were recognized, according to the symptoms and the course of the disease. The incubation period and the locus of entry of bacteria proved less reliable in this respect.

For the last four years all injured patients who were considered to be in danger of a tetanus infection have been passively and actively immunized. If the tetanus symptoms were already apparent, only passive immunization was carried out; 400,000 to 500,000 units of antitoxin were administered daily.

Bronchopneumonia and atelectasis are the most frequent causes of death from tetanus. In severe cases the air ways can be kept free from secretion by means of a tracheotomy. The broad spectrum antibiotic erycinum proved most effective against infection. Carbon dioxide therapy should not be used as respiratory activity can be stimulated by various specific drugs.

A radical elimination of the locus of entry of the bacillus by means of surgery should be performed; however, this measure is now considered of less decisive importance than it used to be.

In the treatment of spasms, curare in combination with other drugs proved to be reliable and effective. Bronchial and diaphragmatic spasms require full curarization. In artificial respiration the iron lung is less helpful than the volumetrically operating Engström respirator.

The importance of proper nursing care of the tetanus patients is emphasized.

—*Victor R. Jablokow, M.D.*

Tropical Ulcer Amongst the Natives of New Guinea. JEKABS KARIKS. *Med. J. Australia*, 1957, 2: 346.

TROPICAL ULCER is a very important disease among the people who live in tropical climates because of its prevalence and prolonged incapacitation. One third to one half of all patients in the hospital at any given time suffer from this disease. This disease is so common that it is often neglected by all persons concerned, the patient, his employer, and the hospital staff.

Tropical ulcer is an acute inflammatory ulcerative process involving the skin and subcutaneous tissues with a characteristic adherent, foul-smelling slough overlying a soft, very tender, easily bleeding granulomatous base with surrounding edema. This is caused by spirochetes and fusiform bacilli. If the disease is neglected the process spreads quickly to involve the underlying muscles, tendons, and even bone. If the acute process is not cleared up secondary infection may cause a chronic nonspecific ulcer.

This disease is found throughout the territory of New Guinea. There has been disagreement as to etiology because of the lack of care in making smears and bacteriologic examinations. Many smears in the past have been taken from the surface of the slough which contain many secondary bacterial organisms. In this particular study every one of 50 cases that were investigated for micro-organisms contained spirochetes and fusiform bacilli.

The predisposing causes are of the highest importance in the incidence of tropical ulcer. About 94 per cent of all patients with acute tropical ulcer gave a history of having received trauma. Sufferers from tropical ulcer are among the dirtiest people of the village or plantation. This disease is rarely seen among people who observe minimum hygiene requirements. It is prevalent in the rainy season and in the hot and humid areas. Perspiration irritates and macerates the skin. Impaired blood circulation promotes the growth of infective organisms. Malnutrition and lack of vitamins may be a predisposing cause to tropical ulcer but there is very little investigative proof to substantiate this. Hypoproteinemia has been widely believed to play a part in causing this disease but in none of the cases investigated were there any signs of protein deficiency.

All groups are affected by the disease although it is comparatively rare in children who are less than 5 years old and in the aged. The most susceptible period is between 15 and 45 years. In the cities the male is more frequently affected than the female because of more outside activity, but on the plantations and in the villages where women engage in outside activities to about the same extent as men the incidence is about equal.

This disease affects the lower part of the body, particularly the dorsum of the foot, the toes, the ankles, and the lower third of the leg. Tropical ulcer leaves no immunity.

The most characteristic symptom of tropical ulcer is the nauseous smell. Pain may be little or great, frequently causing the patient to seek medical help. Another characteristic is the blood-stained, grayish slough which liquefies on the surface. There is edema around the ulcer whose margin and base are highly tender and bleed easily. There is almost never any lymphangitis or swelling of the regional lymph glands. The general health of the patient is not impaired.

Differential diagnosis includes cellulitis, furunculosis, tertiary yaws, cutaneous leishmaniasis, Veldt sore, and varicose veins.

The prognosis is good if prompt action is taken to arrest and control the infection. If the disease is unchecked the infection spreads very rapidly to involve the underlying tendons and muscles and even bones, causing periostitis and later osteomyelitis with sequestration.

There are two main principles in the treatment of tropical ulcer, namely to check and clear the infection and to promote sound granulation and speedy epithelization. The following treatment has reduced healing time over 90 per cent; the healing time requires from 1 to 4 weeks. Upon entering the hospital the patient receives 300,000 units of procaine penicillin by intramuscular injection. This may be repeated on the second day if the ulcer is very widespread but it usually is omitted. The slough is removed with a dry cotton swab on an applicator. All the pockets of the ulcer are cleansed carefully so as not to leave any gangrenous material behind. When the ulcer is clean, it bleeds freely. If the slough is adherent, scissors are used in the removal. No washing of the ulcer is undertaken. After the cleansing the whole sore and surrounding area are painted with 2 per cent gentian violet in alcohol. A simple clean dressing of lint or gauze is applied. On the following day the cleansing of the ulcer is repeated. Usually by the third day the ulcer is showing healthy granulation tissue. On the fourth or fifth day the dressing is changed to an ointment dressing composed of zinc oxide 100 parts, bismuth subgallate 100 parts, vaseline 100 parts, balsam of Peru 50 parts, lanoline 50 parts, and enough liquid paraffin to make a paste. The most important task at this stage of the treatment is to keep the ulcer dry and keep it from becoming macerated. This is frequently difficult because of perspiration and bathing of the patient against the doctor's orders. The treatment of the chronic ulcers is the same as for the acute ulcers.

Personal hygiene and cleanliness are probably the most decisive factors in preventing this disease after a person has received trauma.

—*James M. Brooks, M.D.*

ANESTHESIA

Anesthetic Risk (Le risque anesthésique). RENE SCHNEYDER and JEAN-PHILIPPE LEVADE. *Anesthésie*, Par., 1957, 14: 91.

THE ADVOCATES of deep anesthesia are not convincing. A patient that does not awake when returned to his bed is cause for alarm. Anesthesia should be the simplest and lightest possible.

Potts, who used only light anesthesia, had one questionable cardiac arrest in 500 thoracic operations involving congenital cardiac malformations in patients aged from 10 days to 16 years. Other workers have had fatalities of 5 to 10 per cent. Potts attributes his success to using only a little ether, a little cyclopropane, and no barbiturates and little or no curare.

The use of several drugs increases the risk to the patient. There are reports of cases in which ether and chlorpromazine were incompatible. Others insist that curare and ether are incompatible.

The causes of cardiac arrest in the 14 of 17 cases reported were: anoxia in all its forms, histotoxic, anemic, circulatory, and combined. Hypercapnea and overdosage of the anesthetic were observed. In addition, 2 patients did not awaken; one had a pulmonary artery hemorrhage, 2 were drowned by their own secretions, and convulsions and an explosion (one each) accounted for the other fatalities.

Prevention and care are the best treatments.

—*Sidney Smedresman, M.D.*

The Work of Breathing During Surgical Operations. WILLIAM E. BROWNLEE and FRANK R. ALLBRITTEN, JR. *Arch. Surg.*, 1957, 74: 846.

CALCULATIONS of the work of breathing based upon measurements of the elastic and nonelastic resistance to breathing have been made in patients with normal and with diseased cardiorespiratory systems before, during, and after general anesthesia for surgical operations. Compared with patients with normal cardiovascular systems there was an increase in the work of breathing in patients with pulmonary and cardiac disease. During anesthesia the work of breathing increased greatly. Factors which interfere with the movement of the chest wall, lung, or diaphragm such as retractors against the liver, or a lateral position, re-

sulted in an increase in the work of breathing. The variable increase in the work of breathing required for adequate ventilation during general anesthesia for operation appears to be a factor in the occurrence of ventilatory inadequacy and the associated respiratory acidosis. —*Mary Karp, M.D.*

Problems of Anesthesia for Bronchoscopy. GORDON M. WYANT, ALLEN B. DOBKIN, and CHRISTOPHER J. KILDUFF. *Canad. M. Ass. J.*, 1957, 76: 1011.

THE PROBLEMS and methods of anesthesia for bronchoscopy are reviewed.

Topical anesthesia remains the safest method for anesthesia available at the present time if the dosage used is regulated within safe amounts.

General anesthesia or a combination of general and topical anesthesia should be reserved for those cases which cannot be satisfactorily managed under topical anesthesia alone, and for children. The various methods used for general anesthesia for bronchoscopy in adults are discussed and the precautions are enumerated. The methods include: intravenous barbiturate and suxamethonium relaxant, pentobarbital orally and morphine scopolamine, nitrous oxide, trichlorethylene and a muscle relaxant. Ether, or rectal theopental, or tribromethinal are usually used for children.

A method is described by the authors of balanced analgesic sedation and hypnosis combined with relaxation and local anesthesia for those patients in whom local anesthesia alone proved unsatisfactory. The method is based on small increments of each agent, sufficient to achieve the desired effects without interfering with the vital functions or the protective reflexes of the patient. The drugs used are chlorpromazine (thorazine) for sedation, meperdine (demerol) and nalorphine for sedation and analgesia, dimethyltubocurarine (metubine) for muscle relaxation, edrophonium (tensilon) to end any residual curarization, and topical anesthesia after sedation and relaxation has been accomplished. —*Mary Karp, M.D.*

SURGICAL INSTRUMENTS AND APPARATUS

Determining Blood Pressure in Infants: Use of the Flush Technique. ARTHUR J. MOSS, WILBERT LIEBLING, WALLACE O. AUSTIN, and FORREST H. ADAMS. *California M.*, 1957, 87: 166.

THE FLUSH TECHNIQUE of determining blood pressure in infants was first described in 1952. The present report affirms the reliability of the method. It is now thought that the flush technique indicates mean pressure rather than systolic pressure as previously considered.

A sphygmomanometer cuff is applied to the wrist or ankle which is held at heart level. An elastic bandage or soft rubber drain is wrapped around the distal portion of the extremity to express blood proximally. The manometer is then rapidly inflated to 300 mm. mercury and the elastic wrapping removed. Then the manometer pressure is released at a rate not exceeding 5 mm. mercury per second. At the moment of appearance of a distinct blush of the extremity distal to the cuff, the manometer is read. This end point approximates the mean blood pressure.

Pressure readings with the flush technique are more consistent than with the auscultatory method. With the present method the pressure is normally higher in the upper extremity than in the lower. The difference may be as much as 30 mm. mercury. In practice, this has not interfered with its usefulness in the diagnosis of coarctation of the aorta since the disparity of pressures is much greater than normal in this condition.
—*Lockert B. Mason, M.D.*

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

The Relation Between the Roentgenologic Findings and the Clinical Symptoms of Epipharyngeal Tumors (Ueber die Zusammenhaenge zwischen den Roentgenbefunden und klinischen Symptomen der Epipharynxtumoren). FERENC VÁNDOR. *Fortsch. Roentgenstrahl.*, 1957, 86: 556.

A GROUP of 100 case histories of patients with epipharyngeal tumor, observed at the roentgenologic clinic of the Medical University in Budapest, Hungary, are reviewed. The purpose of this article was not so much to present a comprehensive portrayal of the roentgenologic changes produced by epipharyngeal tumor, as to attempt to clarify the link between the clinical symptoms and the manner of spread of the tumor itself. The diagnosis of this tumor has been adequately discussed in numerous publications such as by Welin in Schinz' *Treatise on Roentgendiagnostics*, 1951.

The first symptom-complex to be considered is that of temporofacial neuralgia, palatal paralysis, and impairment of hearing, known as the Trotter triad. In this syndrome the tumor has spread laterally beneath the deep fascia of the epipharynx and is best seen in the soft tissue shadows in the frontal and sagittal projections.

In the Foix syndrome the third, fourth, fifth, and sixth cranial nerves are involved; the tumor spreads along the lateral wall of the sinus cavernosus. Extension of the tumor has taken place through the foramen lacerum or directly through the clivus. In the former case the roentgenologic shadow defect appears about the foramen itself; in the latter the destructive changes are seen in the clivus, associated with clouding of the sphenoid sinus. For visualization of the changes about the foramen lacerum the author selects the axial, lateral sellar, and lateral tomographic projections; for the changes in the clivus the projection suggested by Stenvers is preferred.

In the Jacod triad or petrosphenoid syndrome with involvement of the second, third, fourth, fifth, and sixth cranial nerves extension of the tumor is predominantly upward with destructive changes in the region of the foramen lacerum and the alae magnae ossis sphenoidalis, best demonstrated roentgenologically with the axial or the orbital exposure.

In the syndrome of Vernet, or the foramen jugulare complex, with involvement of the ninth, tenth, and eleventh cranial nerves, the changes result from the extension of the tumor upward and then posteriorly, with destructive changes in the os basilare and pyramidalis, best demonstrated in the jugular foramen exposure as suggested by Porcher, Porot, and Rossand (*J. radiol. électr.*, 1953, 34: 18).

In the syndrome of Collet-Sicard with involvement of the ninth, tenth, eleventh, and twelfth cranial nerves the extension is either upward and backward with a destructive process in the os basilare and pyramidalis best demonstrated roentgenologically, again, in the jugular foramen projection. If the spread is lateralward it cannot be demonstrated roentgenologically.

In the syndrome of Villaret in which there is extension to the retroparotid space and involvement of the ninth, tenth, eleventh, and twelfth cranial nerves, extension is intracranial and lateralward, with negative roentgenograms, or findings identical with those of the Collet-Sicard syndrome.

In isolated involvement of the mandibular division of the trigeminal the spread is lateralward and roentgenograms are negative; in isolated lesions of the maxillary division the spread is anteriorly with destructive changes in the pterygoid processes, best seen on axial projection. With involvement of the semilunar ganglion the spread is upward with destructive changes in the alae magnae ossis sphenoidalis, best seen on axial projection.

In all of these conditions roentgenologic findings may be absent, particularly in the early stages of the tumor.

The roentgenologic examination permits a topographical diagnosis, especially if the results of the clinical and particularly the neurological examination are given due consideration.

—*John W. Brennan, M.D.*

The Safety of Intravascular Carbon Dioxide and Its Use for Roentgenologic Visualization of Intracardiac Structures. THOMAS M. DURANT, H. M. STAUFFER, M. J. OPPENHEIMER, and ROBERT E. PAUL, JR. *Ann. Int. M.*, 1957, 47: 191.

THE INJECTION of air or oxygen into body cavities or tissues for contrast diagnostic examination or therapy is fraught, as attested by more recent reports, with the risk of serious or even fatal accidents from embolism. Studies carried out by the authors over a period of years have made them believe that the use of carbon dioxide avoids these dangers, since this gas is 20 times as soluble in serum as is air or oxygen. Moreover, it may be safely used intravenously for visualization of intracardiac structures.

The authors summarize the large series of experiments which they have carried out in animals to determine the safety of injecting carbon dioxide, and describe a more limited use in the human being. The investigations included: (a) systemic vein injection in the experimental animals; (b) left ventricular and systemic arterial injection in the experimental animals; (c) visualization of the heart structures in the experimental animals; (d) visualization of the heart structures in the human being.

The following conclusions were reached. Large doses of *pure* carbon dioxide injected repeatedly in the systemic vein and into the left heart of animals proved safe. Doses up to 100 cc. have been injected intravenously into human beings, likewise without untoward effect. This safety is undoubtedly related to the high degree of solubility of the carbon dioxide in serum, and is in marked contrast to the danger and low solubility of air or oxygen. Because of the more

rapid absorption, a fast and accurate timing of the roentgen-ray exposure is necessary when the gas is used for diagnostic contrast studies.

The injection of carbon dioxide directly into the vascular system for visualization of intracardiac structures is a new technique, the possibilities of which are carefully explored. Its most practical use so far has been as a supplement to other procedures in the diagnosis of pericardial disease, particularly effusion, but it may be found to be equally valuable for study of the right ventricular outflow tract. For the former an amount of only 50 cc. is necessary in the average adult, for the latter it is usually 100 cc. The authors emphasize that the carbon dioxide must be *pure* for any human injections.

An absolute contraindication to the method is pulmonary emphysema or fibrosis since the impaired excretory mechanism for carbon dioxide in such a case might result in a high grade of carbon dioxide narcosis.

—*T. Leucutia, M.D.*

Radiokymographic Diagnosis of Traumatic and Post-infarction Cardiac Aneurysm (Traumatisches Herzwandaneurysma, verkalktes Herzwandaneurysma). A. VOGT. *Fortsch. Roentgenstrahl.*, 1957, 86: 439.

THE RADIOLOGIST in Germany often utilizes the method of radiokymography to diagnose cardiac aneurysms. This method was introduced by Stumpf about 30 years ago. The most typical finding in a case of cardiac aneurysm is a systolic lateral movement of the heart wall in the region of the aneurysm. This movement is synchronized with the movement of the aorta.

Two unusual cases of cardiac aneurysm are presented. The first patient suffered a shrapnel injury during World War II. Subsequently he developed an anginal syndrome without abnormal electrocardiographic findings. Roentgenograms showed a shadow projected in the left ventricle. Radiokymographical films were consistent with a cardiac aneurysm in that region caused by the lodged shrapnel.

The second patient suffered from an acute myocardial infarction 15 years prior to the present examination. Now the chest film shows calciumlike deposits alongside of the left heart border with normal electrocardiographic findings. The somewhat atypical radiokymographic films revealed a cardiac aneurysm in that area, however, without the systolic lateral movement which was abolished by the calcium deposit in the aneurysmal wall. The correctness of this diagnosis was proved by autopsy.

References concerning the method and technique of radiokymography are given in the article.

—*Gunars Medins, M.D.*

Effectiveness and Limitations of Percutaneous Splenoportography (Leistungsfachigkeit und Grenzen der perkutanen Splenoportographie). H. ANACKER, K. DEVENS, and G. LINDEN. *Fortsch. Roentgenstrahl.*, 1957, 86: 411.

THE AUTHORS discuss the indications, the limitations, and the dangers of percutaneous splenoportography. In this method 40 c.c. or more of contrast material are injected into the parenchyma of the spleen after a puncture of the spleen has been made in order to visualize the portal circulation. The method is of special diagnostic value in the presence of thrombosis of the portal and splenic veins and liver cirrhosis, and to demonstrate portacaval anastomoses.

In stenoses of the portal and splenic veins portography not only shows prestenotic tortuosity but marked slowing down of the circulation. Under normal conditions the blood courses from the splenic hilus to the branches of the portal vein in from 2.5 to 4 seconds. In partial obstruction this time is increased two- or threefold. Further sequelae of obstruction that can be observed by splenoportography are congestion of the afferent vessels, formation of dilated collaterals, and conglomeration of varicose veins which may even efface the original splenic vein in the splenoportogram. Also dilation of the veins in the thoracic space and varicosities of the esophageal and retrocardial veins can be clearly visualized if at least 40 c.c. of contrast material are injected and serial angiography (at least 4 pictures) is utilized.

In cirrhosis of the liver the following signs are revealed: slowing of circulation, reflux into the afferent areas, scanty vascularization of the portal branches, and decrease of the portovertebral angle.

However, splenoportography is of only limited value in tumors of the liver, the pancreas, and stomach. Only in large tumors are displacements or stenoses of the splenic and portal veins demonstrable. In cases of carcinoma of the stomach infiltration of the splenic vein proves inoperability but negative findings do not rule out inoperability.

The dangers of the method are considerable. In a series of 1,161 splenoportographies compiled from the literature the authors found about 1 per cent of severe complications (hemorrhages or rupture of the spleen). In some cases laparotomy immediately following the intervention revealed hemorrhages of from 50 to 200 c.c., in 1 case 1,500 c.c. In 3 cases splenectomy was necessary because of uncontrollable hemorrhage. In 3 other cases rupture of the spleen occurred between 3 and 17 days after splenoportography and necessitated immediate splenectomy.

To minimize these dangers respiration should be suppressed as much as possible during the intervention because the spleen moves with the excursions of the diaphragm and the minute wound of the puncture may be enlarged to a long gash by the respiratory movements. Some authors recommend using the method only under intratracheal anesthesia with brief paralysis of the respiratory muscles. In patients with prolonged bleeding and clotting time the method is strictly contraindicated —*Werner M. Solmitz, M.D.*

Demonstration and Localization of Suprarenal Tumors by Aortography (Nachweis und Lokalisierung von Nebennierentumoren mittels Aortographie). H. J. SÜSSE and H. RADKE. *Fortsch. Roentgenstrahl.*, 1957, 86: 599.

IT IS OBVIOUS that localization of suprarenal tumors, which may be dystopic, that is lying at some distance from the suprarenal glands, is of paramount importance for the surgeon.

Unless the tumor is palpable, one must rely on the roentgenologic findings for its localization. An enlargement of the gland may be detected in a scout

film, tomographic picture, or pyelogram. Retropneumoperitoneum is a valuable adjuvant and is superior to perirenal gas insufflation because, by filling the entire retroperitoneal space, it facilitates the diagnosis of extra-adrenal tumors. Failures are attributable to technical errors, adhesions, or overlapping of the shadows cast by the kidneys and the suprarenal glands.

If retropneumoperitoneum does not furnish satisfactory results, one may resort to aortography. This method is based on the fact that otherwise invisible blood vessels within the suprarenal gland may be visualized in the presence of a tumor and that the contrast medium may accumulate within the neoplasm.

Three unilateral suprarenal tumors, 2 pheochromocytomas and 1 adenoma, were diagnosed by means of aortography. A catheter may be introduced into the aorta through one of the femoral arteries, or a needle may be inserted under general anesthesia directly into the aorta at the eleventh to twelfth thoracic level.

The method should be reserved for cases in which simpler diagnostic measures have failed.

—*Joseph K. Narat, M.D.*

The Sesamoid Bones in the Differential Roentgenologic Diagnosis of Fractures (Le ossa sesamoidi nella diagnosi radiologica differenziale delle fratture). GY JUSTUS. *Radiol. med.*, Milano, 1957, 43: 575.

FIVE CASES are reported from the Central Hospital of Nográd, Hungary, in which clinical findings were of help in the differential roentgenologic diagnosis. All the conditions discussed are documented with sketches and roentgenographic reproductions.

The author discusses the condition present in a 40 year old male patient who had suffered a complete fracture of the first 3 metatarsals of the right foot as the result of the fall of a heavy object. In this instance the medial sesamoid bone of the great toe appeared to be bipartite. In this case, however, the author diagnosed a fracture of the medial sesamoid bone because of the history and the roentgenologic evidence of trauma, associated with the fact that the two shadows were more widely separated than would be expected in a bipartite sesamoid.

In another patient the roentgenogram revealed a lentil-sized, ossicle-like structure behind the lateral condyle of the right humerus. It was farther lateral and posterior than the sesamoid bone described by Kienboeck. There was no history of trauma and no roentgenologic evidence of bone defect elsewhere, and this shadow was diagnosed as a sesamoid of the elbow in an anomalous position.

The roentgenogram of another patient represented a typical fracture of the lower extremity of the radius with fracture of the styloid process of the ulna. Medial to the fragment of the fractured styloid tip was a small, irregular osseous fragment. The diagnosis of detached and medially displaced fragment of the styloid process of the ulna was based not so much on the characteristic morphology of the tiny osseous formation as on the knowledge of the mechanism of Colles' fracture.

Another case was that of a 26 year old male patient who fell, receiving the impact on the hand. Above the styloid process of the ulna there was a semilunar ossicle with regular and sharply defined borders. The diagnosis of bipartite styloid process of the ulna was based on the obvious absence of any other shadow to represent the tip of the process and on knowledge of the mechanism of an indirect fracture of the styloid process of the ulna. In this instance there had been no fracture.

The roentgenogram of the tibiotarsal joint of an adult individual who was without history of trauma is also reproduced. Here it was possible to recognize the presence of an os trigonum with irregular borders and with poorly depicted osseous cortex. In this instance it was the history of absence of trauma and not the roentgenologic aspect which excluded the presence of a fracture. It may be recalled that the flexion test of the big toe is of marked value in making a diagnosis of Shepherd's fracture.

The author emphasizes the necessity for the roentgenologist in every instance of difficult diagnosis to evaluate the history and clinical findings and not only the roentgenologic data. In cases in which a satisfactory solution of the problem is not attained, the enigma may be solved by means of control examinations carried out after the lapse of an opportune period of time.

—*John W. Brennan, M.D.*

An Instance of Damage to the Scapula From Irradiation (Ein Fall einer Knochenschaedigung des Schulterblattes durch Roentgenbestrahlung). J. KOLÁŘ and R. VRABEC. *Fortsch. Roentgenstrahl.*, 1957, 86: 627.

THE FIRST REPORT of damage to the scapula from irradiation comes from the Radiologic Clinic, and the Clinic for Plastic Surgery, of the Charles University at Prague, Czechoslovakia.

The patient was a 41 year old woman who was operated upon for carcinoma of the right breast with axillary metastases, and later given two series of radiation treatments. Through 2 tangential fields (20 by 24 cm.), 1 supraclavicular field (6 by 8 cm.), and 1 axillary and scapular field (10 by 15 cm.) 2,400 roentgens were given in the first series and 1,600 roentgens in the second (180 kilovolts, 10 milliamperes focus-skin distance of 40 and 30 cm., 1 mm. copper filter; 400 roentgens for 1 field daily).

Following the second series of treatments marked pigmentation and telangiectases of the cutaneous vessels appeared, and lymph stasis of the right upper arm. Three years later a small crust formed which the patient removed. Subsequently an ulcer the size of a hand developed in this area. Roentgenologic examination at this time disclosed fractures of the third to fifth right ribs in the axillary line, and osteoporosis of the ribs and clavicle.

Following this examination sequestra were removed from the scapula until, more than a year later, most of the lateral portion of the scapula had been removed. In 1954, 8 years after the last operation the patient disappeared.

The authors believe that bone damage is more frequently present than generally supposed. The damage remains dormant until infection gains access to the affected area. In the case reported they believe the infection reached the damaged bone through the open ulcer.

They suggest an analogy with the case of Kanthak, F. F. (*J. Am. Dent. Ass.*, 1941, 28: 1925) who reported a necrotic process in the jaw following the extraction of a tooth, and developing years after irradiation therapy over the area involved.

—*John W. Brennan, M.D.*

MISCELLANEOUS

Radioisotopes in Diagnosis (Lokalisationsdiagnostik mit Radioisotopen). P. DOERING. *Schweiz. med. Wschr.*, 1957, 87: 1037.

A COLLECTIVE REVIEW is presented compiling various ways and means to localize pathologic processes with the aid of isotopes. The isotopes which emit gamma-rays may be detected with a scintillation counter, arranged to produce a scintigram. A scintillation counter scans and registers automatically on a graph the gamma-ray activity over the desired area.

The beta-ray emitters require a Geiger counter placed close to the body surface. Lately, positron-emitters (Mn^{52}, Cu^{64}, As^{74}) have been used, promising very good results. A special arrangement of two scintillation counters is used to register the emission of of the positrons in the form of positrocephalograms and "asymmetrogammagrams."

Either the isotope itself or "tagged" organic substances may be used for localization. Recently, interest has been focused on the localization of malignant tumors. Especially important have been recent discoveries concerning deviation of phosphorus and protein metabolism in tumor tissues. Therefore, isotopes of phosphorus and tagged albumin have been used extensively for this purpose. A list of various isotopes used in the diagnosis of certain tumors follows: tumors of the skin—P^{32}; tumors of the breast—K^{42}; metastases from tumors of the breast—Au^{198}; testicular tumors—P^{32}; pelvic tumors—P^{32}; tumors of the eye—P^{32}; tumors of the bladder—P^{32}; tumors of the brain—P^{32},K^{42},I^{131}—fluorescein, I^{131}—albumin, Cu^{64}, As^{74}; tumors of the thyroid—I^{131}; tumors of bone—Ga^{72}; and tumors of the liver—Au^{198}, I^{131}—albumin.

It is also possible to utilize radioisotopes for diagnosis of nonmalignant conditions. They are useful in tests of the thyroid, liver, gallbladder, and kidney. An isotope of iron is being employed for differential diagnosis of blood dyscrasias. The following table represents a compilation of such tests: thyroid—I^{131}; gallbladder—I^{131}—fluorescein, I^{131}—biliselectan, I^{131}—biligrafin; kidney—I^{131}—perabroadil, I^{131}—diodrast; liver—Au^{198}, I^{131}—Rose-Bengal; bone—P^{32}; lung—Fe^{59}, Xe^{133}; heart—Na^{24}; peripheral circulatory system—Na^{24}, P^{32}.

Especially interesting are studies of pulmonary junction with Na^{24} or Xe^{133}, and radiocardiographs with Na^{24} and Co^{60}-vitamin B_{12} in pernicious anemia.

An exhaustive compilation of the literature is attached to the original paper.

—*Gunars Medins, M.D.*

Irradiation Injuries in the Eye of the Rabbit in Relationship to the Dosage and the Quality of the Rays (Schaeden durch Roentgenstrahlen am Kaninchenauge in Abhaengigkeit von Dosis und Strahlenqualitaet). U. EHLING and E. KROKOWSKI. *Fortsch. Roentgenstrahl.*, 1957, 86: 469.

YOUNG RABBITS were used in this study. The dosimeter employed will shortly be described in a dissertation from the First Physics Institute of the Free University of Berlin.

It was found that the threshold dosages for the initiation of the formation of a cataract was 300 to 500 roentgens. This threshold is much lower than that which is generally assumed; however, these animals were only 19 to 27 days old when the irradiations were begun. The process of cataract formation started 15 to 23 days after the administration of irradiation and always involved the posterior suture lines of the lens first, then spread to the posterior layers of the lens cortex, and finally involved the entire lens. This process resulted, not only in opacity of the tissues of the lens, but also in a noticeable retardation in growth of the lens itself.

The authors are, of course, aware that the results procured in this study cannot be applied directly to the human subject, nevertheless, the lenses of these animals behaved in most respects so nearly in consonance with the results described in human beings that the authors believe the effects of these dosages will be to a certain degree analogous to those to be expected for human subjects. Thus they think that the eye of the young human subject will prove much more sensitive to irradiation effects than that of an adult.

It is true that the effects of irradiation in other portions of the eye, even those observed in the cornea, tend to regress; however the authors have not observed regressive tendencies in the manifestations of irradiation in the lens itself.

In view, therefore, of the optimistic statements from other workers with reference to the innocuity for the eye of irradiation practices, for instance, in irradiation therapy of the nasal sinuses, the authors feel justified in calling attention to these results as suggesting the inapplicability of such estimations without concomitantly stating the age of the subject so treated, and they believe that in all instances of the use of irradiation in the region of the eye these considerations should be kept in mind.

—*John W. Brennan, M.D.*

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Excitability of the Cerebral Cortex at Subnormal Temperatures (L'eccitabilità della corteccia cerebrale a temperature subnormali). ALDO MORELLO. *Ann. ital. chir.*, 1957, 33: 1017.

THE AUTHORS performed experiments on 47 dogs, recording 50 experiences. The dogs were divided into five groups. Eight dogs were subjected to electric shock at 28 degrees C. and 2 at 30 degrees C. The second group was subjected to electric shock under pentothal anesthesia and the third group was shocked while completely paralyzed under succinylcholine (anectine). The fourth group received heavy doses of chlorpromazine, The control group received no drugs except local anesthesia.

Similar tests were performed on 8 human patients under similar conditions. In all, 40 electric shock treatments were given. The technique was similar in all and the usual clinical factors were the same. These factors consisted of an electrical current of 115 volts and 60 cycles, with a charge of 140 volts for a duration of 0.4 seconds.

The results obtained were the same in the human beings as those obtained in the experimental dogs. The most important observation was the almost complete absence of motor and vegetative response to electric shock in the hypothermic state, which was not observed under the other conditions.

The author believes that these results can be obtained in patients with epilepsy and that subnormal temperatures can be used for the excision of lesions with high epileptic activity.

—*Lucian J. Fronduti, M.D.*

Evidence, Including In Vivo Observations, Suggesting Mechanical Blockage Rather Than Reflex Vasospasm as the Cause of Death in Pulmonary Embolization. WILLIAM H. KNISELY, JOHN M. WALLACE, M. S. MAHALEY, JR., and W. M. SATTERWHITE, JR. *Am. Heart J.*, 1957, 54: 483.

THE INVESTIGATION reported was designed to determine whether pulmonary embolization produces reflex constriction in the pulmonary vascular bed, a problem related to the frequently heard clinical argument that "One main pulmonary artery can be tied off under surgical anesthesia. In the unanesthetized, embolization of one artery or less can cause death. Reflexes, not damped by anesthesia as they are during surgery, must account for these deaths."

Direct in vivo microscopy, with magnifications from 16 to 900 times and quartz rod transillumination, has been used to study the lungs of 66 rabbits and 13 cats with 10 to 2,000 particles or with air bubbles. By the authors' interpretation the cause of death is the mechanical blockage of the pulmonary vessels. No observation necessitated the invocation of reflex vasoconstriction for its explanation. The animal-experimental literature relevant to the hypothetical reflex is discussed and is thought, by the authors, to be largely an accumulation of negative evidence. The clinical and pathologic literature on human pulmonary embolism emphasizes that fatal outcome is usually caused by massive mechanical blockage, although lesser emboli may be found in the presence of other debilitating disease.

—*W. Foster Montgomery, M.D.*

Muscle Relaxants and Cholinesterase (Muskelrelaxantien und Cholinesterase). W. GROHMANN. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1957, 285: 210.

THE AUTHOR, of the Surgical Department of the University of Leipzig, Germany, discusses the biochemical processes in the transmission of neuromuscular impulses, and reports experiments to determine the enzymatic hydrolysis of acetylcholine and myorelaxin, and the degree of inhibition of serum and erythrocyte cholinesterase by myorelaxin in vivo and in vitro.

The unspecific serum cholinesterase and the specific cholinesterase which occurs in erythrocytes and at the motor end plate catalyze the hydrolysis of acetylcholine at a more rapid rate than the hydrolysis of other esters. At low acetylcholine concentrations the specific enzyme has higher activity than the unspecific enzyme. High substrate concentrations, however, inhibit the specific but not the unspecific cholinesterase. The level of serum cholinesterase is maintained constant and rapidly restored to normal following its reduction. A lowered level of serum cholinesterase leads, however, neither to disturbance of neuromuscular transmission nor other clinical symptoms as long as the activity of the specific cholinesterase remains normal. The physiological function of serum cholinesterase is, therefore, thought to be that of a reserve mechanism by which the specific enzyme is protected (1) from other cholinesters, and (2) from inhibition by high acetylcholine concentrations.

The author holds that in the light of this functional interpretation, a revaluation of the mode of action of muscle-relaxing drugs is required. The action of succinylcholin is commonly interpreted as an inhibition of cholinesterase, leading to the accumulation of acetylcholine at the motor end plate.

Experiments by the author showed (1) the spontaneous decompositions of acetylcholine and of succinylcholine to proceed at the same rate, (2) the enzymatic hydrolysis of succinylcholine by serum cholinesterase to proceed at one-fifth to one-sixth of the rate of hydrolysis of acetylcholine, (3) the hydrolysis of succinylcholine by erythrocyte cholinesterase to be virtually zero. The in vitro rate of hydrolysis of succinylcholine by serum cholinesterase should lead to more rapid destruction of the drug than is clinically observed. It is, therefore, concluded that in vivo the compound is not accessible to the serum enzyme. This lends support to the hypothesis that the neuromuscular blockage caused by succinylcholine is produced by direct reaction with the same end plate reactor that reacts with acetylcholine and with curare.

—*Werner M. Solmitz, M.D.*

Characteristics and Prospects of Surgical Removal of Malignant Tumors (Grundzuege und Aussichten der chirurgischen Entfernung maligner Tumoren). R. WANKE. *Münch. med. Wschr.*, 1957, 99: 977.

THE AUTHOR reports his experiences with, and views concerning, the therapy of cancer of the esophagus, bronchus, stomach, rectum, and breast.

Carcinoma of the esophagus may be treated surgically or by radiotherapy. The latter has a 40 per cent 2 year survival rate (twice as high as an untreated group), with an occasional 5 year survival. Surgical extirpation results in a 15 per cent 5 year survival. However, only 10 (20 per cent) of these lesions are resectable and the operation carries a mortality of about 40 per cent. Lesions of the upper and middle third of the esophagus, comprising about 70 per cent (15 per cent for the upper third and 55 per cent for the middle third) of all esophageal carcinomas, are most difficult to treat surgically. About one-third of the patients operated upon die as a result of recurrence of the disease. In this area, roentgen therapy can give as good a late result as surgery and with greater safety. In the lower third of the esophagus, the operative mortality is from 10 to 20 per cent. Radiation therapy is less efficient in this area because of the difficulty in localizing a rotating x-ray dosage. In summary then, it appears that a 1 to 3 per cent 5 year survival rate is as high as can be obtained in patients with esophageal carcinoma.

The surgical treatment of bronchiogenic carcinoma carries a mortality of from 5 to 15 per cent. Five year survival rates vary from 10 to 30 or 40 per cent, the latter obtaining when the lesion is discovered early as part of a routine serial x-ray examination. Unfortunately, only 25 to 40 per cent of the patients with this disease are candidates for a radical operation. Of all bronchiogenic carcinomas, only 2 to 5 per cent have a 5 year survival rate. A more vigorous attempt to uncover the lesions by periodic x-ray examinations could materially improve this situation.

Advances in the treatment of cancer of the stomach have resulted in a 5 year survival rate of 20 to 25 per cent. However, only about 51 per cent of the patients with this disease are resectable and only 6 to 10 per cent of the patients with cancer of the stomach will live 5 years or longer. The thoracoabdominal approach has made surgical extirpation of lesions of the fundus and cardia possible. The operation has also been extended to include neighboring involved organs and lymph nodes. The spleen, left lobe of the liver, pancreas, and, occasionally, an involved transverse colon have been resected with the stomach. The more radical procedures, however, carry a mortality which may be twice as high as that seen with partial gastrectomy. The use of palliative gastric resection has also been found to be of great value in prolonging the patient's life. A more vigorous surgical treatment of chronic atrophic gastritis, gastric polyps, and gastric ulcers—all pre-malignant lesions—would also improve the chances of eliminating gastric carcinoma.

The introduction of antibiotics has permitted a wider application of radical procedures in the treatment of cancer of the rectum. It has also made the sphincter-preserving operations safer. The latter were introduced by Hochenegg in Vienna and advocated by such surgeons as Bacon, Babcock, d'Allaine, and Hollenbach. At least 8 to 12 cm. of rectum proximal to the anus must be preserved in order to retain fecal continence. As with most carcinomas, it is most important to detect the lesion early in order to obtain good results. About two thirds of all rectal cancers can be felt by the examining finger, i.e., all those within 10 cm. of the anus. Herein lies a means of bringing patients to surgery earlier and providing them with a better chance for cure. Rectal bleeding in the older age groups should never be casually attributed to hemorrhoids. Rectal bleeding was the presenting complaint of 71 per cent of patients seen at the Surgical Clinic of the University of Kiel.

The treatment of carcinoma of the breast has recently been improved through the increased use of preoperative and postoperative radiation therapy. Five year survival rates have increased in direct proportion to the intensity of the radiation therapy, when combined with a radical operation. A 50 per cent 5 year survival rate is attainable. The radical procedures themselves have undergone revisions. The parasternal, retrocostal, and internal mammary chain of lymph nodes are being removed with lesions of the inner quadrant of the breast.

In conclusion, the author refers to the survey of cancer made by K. H. Bauer, according to which only 18 per cent of all cases of cancer are curable. A more recent survey by the American Cancer Society quotes a figure of 25 per cent. Through a more intensive search for this disease and treatment in its early stages, the rate of cure could be doubled.

—*J. C. Rosenberg, M.D.*

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Micrococcic (Staphylococcic) Infections in a General Hospital. DONALD N. WYSHAM and WILLIAM M. M. KIRBY. *J. Am. M. Ass.*, 1957, 164: 1733.

A SERIES of 189 patients who had micrococcic (staphylococcic) infections, which occurred during a period of 3.5 months, were investigated. In 100 cases the infections appeared during the time the patient was hospitalized, and in 32 they appeared within 60 days of the patient's discharge from the hospital. The remainder of the infections had been acquired before hospital admission. The infections that were investigated included 37 infections of surgical wounds and 14 cases of micrococcic pneumonia. Twelve of the patients were found to have micrococcic bacteremia and 6 of these died.

In the entire group of 189 patients, 24 deaths occurred, with micrococcic infections a contributing factor in each case. Twenty-one of the deaths were in the group of patients whose infections appeared during hospitalization. In 28 of the 132 infections (21 per cent) which were probably acquired as a result of hospitalization, the causative organisms were sensitive only to bacitracin. Studies with bacteriophage typing indicated that various strains of micrococci were isolated from the infections except in the puerperal and neonatal infections, in which a single bacteriophage type, 52/42B/44A, appeared to be responsible for most infections.

Most of the micrococcic infections which appeared during the period of hospitalization or shortly after discharge were the result of crossinfection within the hospital. Such infections are theoretically preventable, and the following of preventive measures is urged.

—*John J. Maloney, M.D.*

DUCTLESS GLANDS

Proton Irradiation of the Pituitary and Its Metabolic Effects. ROLLIN K. MCCOMBS. *Radiology*, 1957, 68: 797.

THERE IS evidence of a hormonal influence on tumors by the pituitary gland. Selective destruction of the gland by means other than surgery has been sought. The author has demonstrated that radiation extirpation with a proton beam can be accomplished. The presentation is supported by graphs, drawings, radiographs, and photographs of pathological material. A total of 26 patients were studied, and of this group autopsy was eventually performed in 22.

A proton beam was selected because it can be focused, and in animals it produced a discrete lesion. There is very little tissue scattering, and the depth dose is great compared with the surface dosage. To obtain the desired depth dose a rotational technique was used. Initially the work was limited to dogs with and without mammary cancers. Single doses of 5,000 rads, or over, would produce atrophy of the entire gland. Higher dosage brought about the effect sooner. A dose of 30,000 rads was comparable in effect to surgical extirpation. Evaluation of the effectiveness of pituitary destruction was accomplished by studying the function of target organs (thyroid, gonads).

In the animal experiments the lethal effects of irradiation could be ascribed to nerve and brain lesions. The third, fourth, and fifth nerves were particularly susceptible. There were some satisfactory results recorded in dogs with cancer of a mammary gland.

The human experiments were very carefully controlled. A cyclotron was used to generate the proton beam. The patient was very carefully positioned by the use of biplanar radiographs of the pituitary fossa. A plastic face mask was used to stabilize the head, and the beam subsequently focused on the pituitary gland. By the use of lucite phantoms of the head, the dosage at various distances from the pituitary was noted. The temporal lobe of the brain and cranial nerves received from 10 to 20 per cent of the dose to the pituitary; the optic nerves about 20 to 30 per cent.

Patients with metastatic breast cancer were selected on the basis of progressive metastases; failure of conventional surgical or radiological therapy, and failure of hormonal treatment, adrenalectomy, or irradiation of the ovaries.

Initially a dosage of 14,000 rads was given in a period of 63 days. Some of the patients who were treated later were given 30,000 rads over a 2 week period. Few symptoms were present as a result of the irradiation. To test the effectiveness of pituitary irradiation, the radioiodine uptake of the thyroid and the urinary excretion of pituitary gonadotropins were measured. There was usually a marked depression in the uptake of radioiodine.

In the group of patients treated, 5 showed evidence of healing of the bone metastases, and in 2 the metastases remained stationary. The hormonal changes induced by radiation could be controlled by replacement therapy. Two patients are alive 16 months after irradiation.

Histologic damage is evident in all of the pituitaries of those who survived 5 months and who received at least 20,000 rads. In 1 case no gross evidence of the pituitary could be found.

The author states that this investigation is significant as it demonstrates that a deep seated organ can be selectively destroyed without damage to other tissues. Irradiation can be used to depress the function of the pituitary. Some of the patients were benefited. In addition to the use of radiation to destroy the healthy pituitary, it might be of value in the treatment of malignant exophthalamos, and primary pituitary tumors.

—*R. L. Lawton, M.D.*

Thyroiditis; a Review and Presentation of 40 Pathologically Proven Cases of Chronic Thyroiditis. GEORGE H. YEAGER, JOSEPH B. WORKMAN, WILLIAM A. HOLBROOK, and DAVID H. PATTEN. *South. M. J.*, 1957, 50: 1005.

THIS STUDY of thyroiditis is organized according to the following classification:

I. Acute Thyroiditis
   (a) Suppurative
   (b) Nonsuppurative
II. Subacute or Granulomatous Thyroiditis
III. Chronic Thyroiditis
   (a) Struma lymphomatosa (Hashimoto's type)
   (b) Struma fibrosa (Riedel's type)

Acute thyroiditis is designated as bacterial and noninfectious. The treatment is usually conservative with occasional needle aspiration to prove the presence or absence of pus, and rarely, incision and drainage. Principally, close observation and prompt tracheotomy for respiratory difficulty is the proper course.

Subacute thyroiditis is usually of unknown etiology. Its treatment is conservative except that a fair percentage will require surgical intervention for a specific diagnosis.

Forms of chronic thyroiditis are the most difficult problem in management. The two principal types, Hashimoto's struma and Riedel's struma, are both best handled by surgical exploration and biopsy. This is true because carcinoma of the thyroid mimics these diseases and they may coexist. Biopsy and removal of degenerating areas are all that are suggested generally although in the case of Hashimoto's disease subtotal resection is probably the procedure of choice. In Riedel's struma the establishment of a definite diagnosis and the release of tracheal compression is all that should be attempted surgically.

—*Robert W. Williams, M.D.*

Subacute Thyroiditis; a Disease Commonly Mistaken for Pharyngitis. ROBERT VOLPE and MACALLISTER W. JOHNSTON. *Canad. M. Ass. J.*, 1957, 77: 297.

A REVIEW of 56 cases of subacute thyroiditis is presented. This disease is an acute, subacute or chronic self-limiting inflammation of the thyroid gland of unknown etiology. There seems to be a definite increase in incidence of subacute thyroiditis in recent years

which may be due to improved recognition of the disease. In this series, 10 cases were found in the hospital records from 1944 to 1950; 22 cases in the next 6 years; the remaining 24 patients were not admitted to the hospital but treated as outpatients. Females are preponderant over males; in a ratio of 52 to 4.

The symptoms include a prodromal period of malaise and fatigue, mild to severe, often with signs of upper respiratory infection with muscular aches, pains, and chilly sensations. The most common local symptom was pain in the region of the thyroid gland frequently radiating to the ears. Some patients experienced difficulty in swallowing. Later systemic symptoms include feverishness, night sweats, and weight loss.

The chief and most characteristic sign of thyroiditis was enlargement, frequently with tenderness, of the thyroid gland. This enlargement was diffuse, although it might start in one lobe and gradually spread to the other one. Tenderness of the gland varied in degree. About half of the patients appeared to be acutely but not seriously ill. Fever was present in half of the cases; this ranged from very little to 104 degrees. Signs of hyperthyroidism were seen in 26 patients, manifested as restlessness, warm moist skin, tremor, tachycardia, and wide pulse pressure. Lid lag and stare were occasionally observed. In 11 cases the state of hyperthyroidism passed into temporary hypothyroidism with sluggishness, dry hair and skin, low husky voice, and slow pulse.

The course of the disease varies widely, lasting on the average from 2 to 4 months. This disease is self-limiting but various types of treatment have shortened the course of the disease. There are no sequelae of any importance.

Laboratory findings show a high serum protein-bound iodine and increased basal metabolic rate; in the early stages of inflammatory destruction of the gland a state of hyperthyroidism is revealed. The radioactive iodine uptake is depressed because the damaged parenchymal cells fail to function normally. As recovery takes place, the radioactive iodine uptake increases and the serum protein-bound iodine returns to normal levels. The erythrocyte sedimentation rate is elevated.

The diagnosis of this disease was most frequently confused with pharyngitis, but more careful examination revealed the difference. Simple goiter may make the diagnosis difficult, but this can be determined by the aforementioned laboratory tests.

The treatment of choice by the authors was roentgen therapy with a total dose of 200 to 400 roentgens. This was given in 4 divided doses and the whole gland was treated. Some patients needed second and third courses of the above irradiation. Twenty-four of the patients were treated with x-ray; 3 were treated with cortisone with favorable results; 7 patients received antibiotics with no benefit; 9 patients had thyroidectomies with beneficial results; 21 patients received no treatment at all and the course of their disease was longer than in the treated group.

The pathologic picture reveals an acute inflammatory destruction of the follicles, with edema and infiltration of polymorphonuclear leucocytes. This is followed by the appearance of histiocytes, by colloid increase with giant-cell formation, and a granulomatous appearance with fibroblastic proliferation. With recovery the granulomatous reaction recedes and the follicles regenerate but it is found that some permanent interstitial fibrosis remains.

—*James M. Brooks, M.D.*

Lymphocytic Thyroiditis in 757 Thyroid Operations. CARL A. PETERSON and FREDERIC P. SHIDLER. *Am. J. Surg.*, 1957, 94: 223.

THE AUTHORS studied 757 thyroid glands which were operated upon during the years 1949 through 1956. They were particularly interested in the diffuse lymphocytic infiltrations of the thyroid gland which they termed lymphocytic thyroiditis. Of the thyroid material studied, 10.1 per cent was designated as lymphocytic thyroiditis. A large proportion of these cases did not show the follicular atrophy and epithelial hyperplasia usually regarded as diagnostic of Hashimoto's disease. Ninety-eight per cent of their cases occurred in females. Four of these patients had goiters which were described as firm, sometimes diffuse, but with greater prominence of one lobe or of the isthmus. None of the patients had preoperative myxedema.

A study of the histories and clinical findings in this group of patients suggests that lymphocytic thyroiditis is often indistinguishable clinically from nodular goiter. The authors believe that the various types of diffuse lymphocytic infiltration of the thyroid gland, whether or not they are associated with follicular and epithelial changes, represent pathologic variants of a single disease process. Since the age incidence of lymphocytic thyroiditis was at a peak during the period of menstrual change, the authors feel that a hormonal cause is probable.

—*Alan Thal, M.D.*